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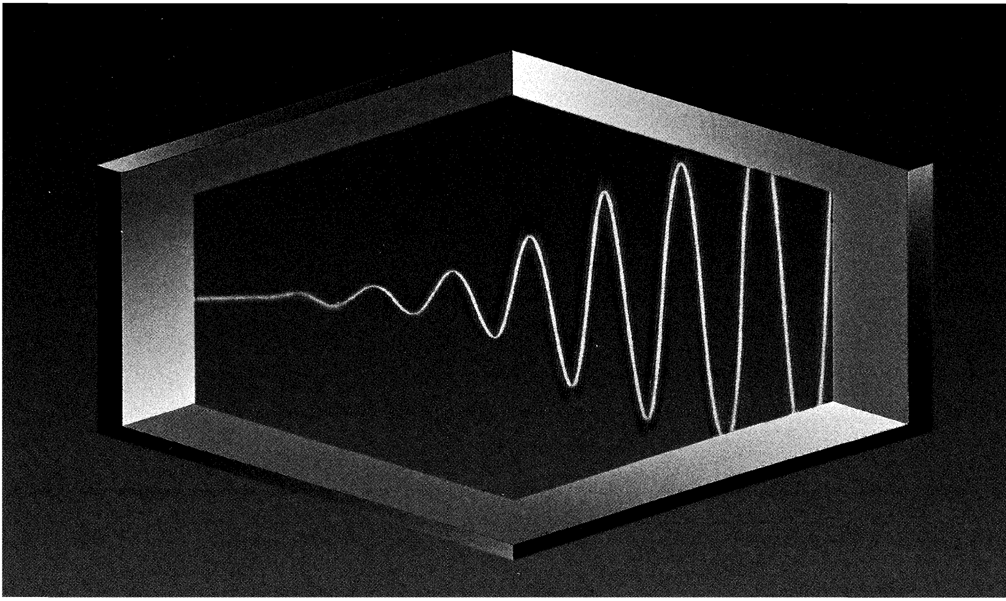

Power Modules

SIMOPAC and IGBT

Data Book 1992/93

General Information

SIMOPAC® Modules

IGBT Modules

Package Outlines and Circuit Diagrams

Semiconductor Group-Addresses
Information on Literature

Published by
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Power Modules

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General Information

SIMOPAC Modules

	Type	V_{DS} V	I_D A	R_{thJC} K/W	P_{tot} W	$R_{DS(on)}$ mΩ	Package Figure	Page
	Single Switches							
	BSM 101 AR	50	200	≤ 0.18	700	3	1	17
S	BSM 111 AR	100	200	≤ 0.18	700	8.5	1	24
S	BSM 121 AR	200	130	≤ 0.18	700	20	1	31
S	BSM 141	400	60	≤ 0.2	625	75	1	38
S	BSM 151	500	48	≤ 0.2	625	120	1	44
S	BSM 151 F	500	56	≤ 0.18	700	110	1	50
S	BSM 181	800	36	≤ 0.18	700	240	1	57
S	BSM 181R	800	36	≤ 0.18	700	240	1	57
S	BSM 181 F	800	34	≤ 0.18	700	320	1	64
S	BSM 191	1000	28	≤ 0.18	700	370	1	71
S	BSM 191 F	1000	28	≤ 0.18	700	420	1	78
	Half-Bridges							
S	BSM 204 A	50	2 × 200	≤ 0.31	400	4.5	2/a	85
S	BSM 214 A	100	2 × 125	≤ 0.31	400	13	2/a	92
S	BSM 224 A	200	2 × 81	≤ 0.31	400	30	2/a	99
S	BSM 244 F	400	2 × 45	≤ 0.31	400	100	2/a	106
S	BSM 254 F	500	2 × 35	≤ 0.31	400	170	2/a	113
S	BSM 284 F	800	2 × 20	≤ 0.31	400	480	2/a	120
S	BSM 294 F	1000	2 × 18	≤ 0.31	400	630	2/a	127

IGBT Modules

	Type	V_{CE} V	I_C A	R_{thJC} K/W	P_{tot} W	$V_{CE(sat)}$ V	Package Figure	Page
	Single Switches							
S	BSM 200 GA 100 D	1000	200	≤ 0.07	1750	2.8	4	268
S	BSM 200 GA 120 D	1200	200	≤ 0.07	1750	2.8	4	276
S	BSM 300 GA 100 D	1000	300	≤ 0.05	2500	2.8	4	284
S	BSM 300 GA 120 D	1200	300	≤ 0.05	2500	2.8	4	292

IGBT Modules (cont'd)

	Type	V_{CE} V	I_C A	R_{thJC} K/W	P_{tot} W	$V_{CE(sat)}$ V	Package Figure	Page
	Half-Bridges							
S	BSM 25 GB 100 D	1000	2 × 25	≤ 0.4	300	2.8	2/c	172
S	BSM 25 GB 120 D	1200	2 × 25	≤ 0.4	300	2.8	2/c	180
S	BSM 50 GB 100 D	1000	2 × 50	≤ 0.25	500	2.8	2/c	204
S	BSM 50 GB 120 D	1200	2 × 50	≤ 0.25	500	2.8	2/c	212
S	BSM 75 GB 100 D	1000	2 × 75	≤ 0.2	625	2.8	2/c	220
S	BSM 75 GB 120 D	1200	2 × 75	≤ 0.2	625	2.8	2/c	228
S	BSM 100 GB 100 D	1000	2 × 100	≤ 0.13	1000	2.8	5/b	236
S	BSM 100 GB 120 D	1200	2 × 100	≤ 0.13	1000	2.8	5/b	244
S	BSM 150 GB 100 D	1000	2 × 150	≤ 0.1	1250	2.8	5/b	252
S	BSM 150 GB 120 D	1200	2 × 150	≤ 0.1	1250	2.8	5/b	260
	3-Phase Full-Bridges							
	BSM 05 GD 100 D	1000	6 × 5	≤ 4	30	2.8	6	140
	BSM 10 GD 100 D	1000	6 × 10	≤ 2.5	50	2.8	6	148
S	BSM 15 GD 100 D	1000	6 × 15	≤ 0.8	150	2.8	3	156
S	BSM 15 GD 120 D	1200	6 × 15	≤ 0.8	150	2.8	3	164
S	BSM 25 GD 100 D	1000	6 × 25	≤ 0.4	300	2.8	3	188
S	BSM 25 GD 120 D	1200	6 × 25	≤ 0.4	300	2.8	3	196
	Choppers							
	BSM 25 GAL 100 D	1000	25	≤ 0.4	300	2.8	2/b	172
	BSM 25 GAL 120 D	1200	25	≤ 0.40	300	2.8	2/b	180
	BSM 50 GAL 100 D	1000	50	≤ 0.25	500	2.8	2/b	204
	BSM 50 GAL 120 D	1200	50	≤ 0.25	500	2.8	2/b	212
	BSM 75 GAL 100 D	1000	75	≤ 0.2	625	2.8	2/b	220
	BSM 75 GAL 120 D	1200	75	≤ 0.20	625	2.8	2/b	228
	BSM 100 GAL 100 D	1000	100	≤ 0.13	1000	2.8	5/a	236
	BSM 100 GAL 120 D	1200	100	≤ 0.13	1000	2.8	5/a	244
	BSM 150 GAL 100 D	1000	150	≤ 0.1	1250	2.8	5/a	252
	BSM 150 GAL 120 D	1200	150	≤ 0.10	1250	2.8	5/a	260

SIMOPAC Modules

Type	Ordering Code	Page
Single Switches		
BSM 101 AR	C67076-S1018-A2	17
BSM 111 AR	C67076-S1013-A2	24
BSM 121 AR	C67076-S1014-A2	31
BSM 141	C67076-A1010-A2	38
BSM 151	C67076-A1004-A2	44
BSM 151 F	C67076-A1050-A2	50
BSM 181	C67076-A1001-A2	57
BSM 181R	C67076-A1016-A2	57
BSM 181 F	C67076-A1052-A2	64
BSM 191	C67076-A1009-A2	71
BSM 191 F	C67076-A1053-A2	78
Half-Bridges		
BSM 204 A	C67076-S1102-A2	85
BSM 214 A	C67076-S1100-A2	92
BSM 224 A	C67076-S1101-A2	99
BSM 244 F	C67076-A1155-A2	106
BSM 254 F	C67076-A1150-A2	113
BSM 284 F	C67076-A1152-A2	120
BSM 294 F	C67076-A1151-A2	127

IGBT Modules

Type	Ordering Code	Page
Single Switches		
BSM 200 GA 100 D	C67076-A2001-A2	268
BSM 200 GA 120 D	C67076-A2006-A2	276
BSM 300 GA 100 D	C67076-A2000-A2	284
BSM 300 GA 120 D	C67076-A2007-A2	292

IGBT Modules (cont'd)

Type	Ordering Code	Page
Half-Bridges		
BSM 25 GB 100 D	C67076-A2101-A2	172
BSM 25 GB 120 D	C67076-A2109-A2	180
BSM 50 GB 100 D	C67076-A2100-A2	204
BSM 50 GB 120 D	C67076-A2105-A2	212
BSM 75 GB 100 D	C67076-A2104-A2	220
BSM 75 GB 120 D	C67076-A2106-A2	228
BSM 100 GB 100 D	C67076-A2103-A2	236
BSM 100 GB 120 D	C67076-A2107-A2	244
BSM 150 GB 100 D	C67076-A2102-A2	252
BSM 150 GB 120 D	C67076-A2108-A2	260
3-Phase Full-Bridges		
BSM 05 GD 100 D	C67076-A2506-A52	140
BSM 10 GD 100 D	C67076-A2507-A52	148
BSM 15 GD 100 D	C67076-A2500-A2	156
BSM 15 GD 120 D	C67076-A2504-A2	164
BSM 25 GD 100 D	C67076-A2501-A2	188
BSM 25 GD 120 D	C67076-A2505-A2	196
Choppers		
BSM 25 GAL 100 D	C67076-A2008-A2	172
BSM 25 GAL 120 D	C67076-A2009-A2	180
BSM 50 GAL 100 D	C67076-A2002-A2	204
BSM 50 GAL 120 D	C67076-A2010-A2	212
BSM 75 GAL 100 D	C67076-A2003-A2	220
BSM 75 GAL 120 D	C67076-A2011-A2	228
BSM 100 GAL 100 D	C67076-A2004-A2	236
BSM 100 GAL 120 D	C67076-A2012-A2	244
BSM 150 GAL 100 D	C67076-A2005-A2	252
BSM 150 GAL 120 D	C67076-A2013-A2	260

Maximum Ratings

The maximum rating specified are absolute ratings which, if exceeded, may result in the destruction or permanent function impaiment of the component. When testing the component, as for example in respect to breakdown voltages, or during application, protection is to provided in order to reliably ensure that maximum ratings are not eceeded.

Characteristics

Typical characteristics describe the components behaviour that define the operating conditions. The numerical values and diagrams pertain to the component type and shall not be considered as characteristics of an individual component. The minimum and maximum ratings stated for reasons of essential quality and application requirements describe the actual spread of the characteristics, whereas spread curves in diagrams usually specify the spread range which is to be expected. Electrical values are grouped into static "DC" values and "dynamic" AC values. The thermal resistance is closely related to the maximum ratings and, constituting the upper spread value, comes immediately after the maximum ratings.

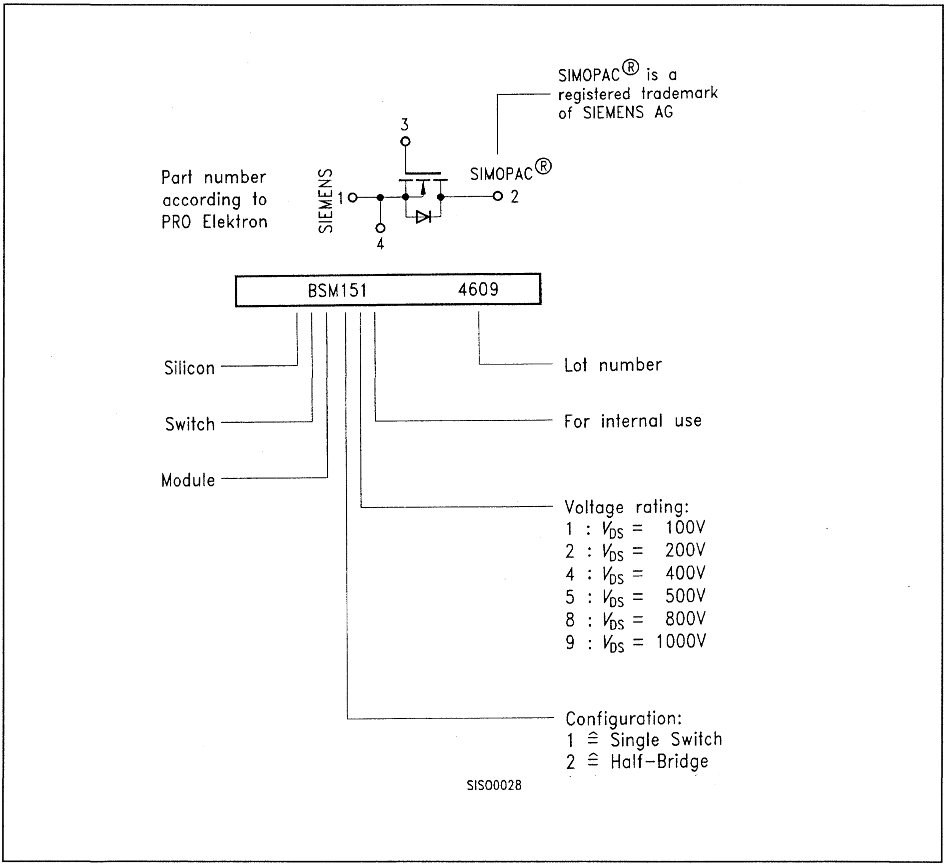
Thermal Resistance

The heat dissipation of components despends on material and thickness of the PC board and of the conductor path (inherent heating), as well as on the packing density (external heating). Hence, inherent and external heating determine the junction temperature, and thus the permissible thermal stress of the components.

The values for thermal resistance given in the data sheets should only be used for rough estimations of the junction temperature T_j, since they were measuerd under certain laboratory conditions, where no regard was paid to specific applications.

The data sheet parameters of thermal resistance R_{thJC} of power semiconductors are specified for calculation of the chip temperature T_j and control of the devices in the laboratories (quality of the chip bonding) or by the clients.

SIMOPAC® Modules



BSM xxx R	Modules with internal gate series resistor (approx. 1.4 Ω)
BSM xxx F	Modules in FREDFET technology FREDFET FET with inrinsic **F**ast **R**ecovery **E**pitaxial **D**iode
BSM xxx AR	With gate series resistor (approx. 1.4 Ω) assembly with avalanche rated SIPMOS chips

SIMOPAC® Modules

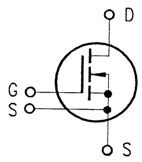
SIMOPAC modules are high-performance SIPMOS switches which can handle high currents as several SIPMOS transistor chips are paralleled.

The chips taken from one semiconductor wafe are mounted on a rotationally symmetric, electrically insulating ceramic substrate (DCB = **D**irect **C**opper **B**onding) designed on the basis of RF-engineering aspects. The separation of control and load circuits is made at chip level in order to eliminate the source-side negative feedback inductances (bond inductance). The SIMOPAC FREDFET-modules (**F**ast **R**ecovery **E**pitaxial **D**iode-FET) are particularly designed for switching inductive loads as well as for bridge configurations. They feature a very low reverse recovery charge and thus a shorter reverse recovery time of the intrinsic diode in the SIPMOS transistor.

Product Line

- Single switches 50 V ... 1000 V; 200 A ... 28 A
- Half-bridges 50 V ... 1000 V; 2 × 200 A ... 2 × 18 A

Single switch **Half bridge**



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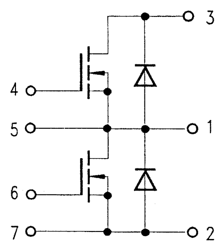

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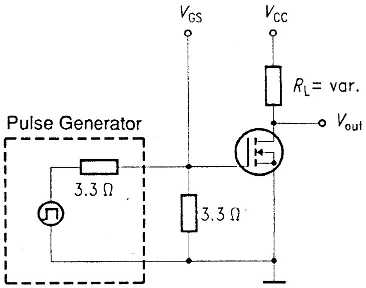
Application (selection)

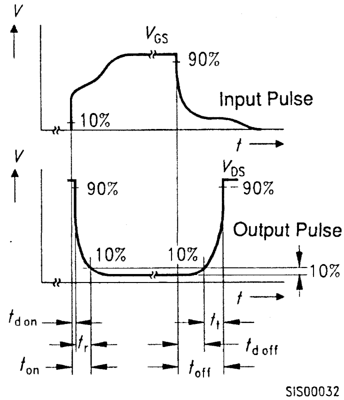
- Welding equipment
- Uninterruptible power systems (UPS)
- Inductive heating
- Switched-mode high-power supplies
- Drive systems

Measurement of Switching Times

Test circuit



Definition of switching times



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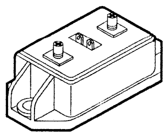
SIMOPAC® Module BSM 101 AR

V_{DS} = **50 V**
I_D = **200 A**
$R_{DS(on)}$ = **3.0 mΩ**

- Power module
- Single switch
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1)]



Type	Ordering Code
BSM 101 AR	C67076-S1018-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	50	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	50	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 105 °C	I_D	200	A
Pulsed drain current, T_C = 105 °C	$I_{D\ puls}$	600	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	700	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.18	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

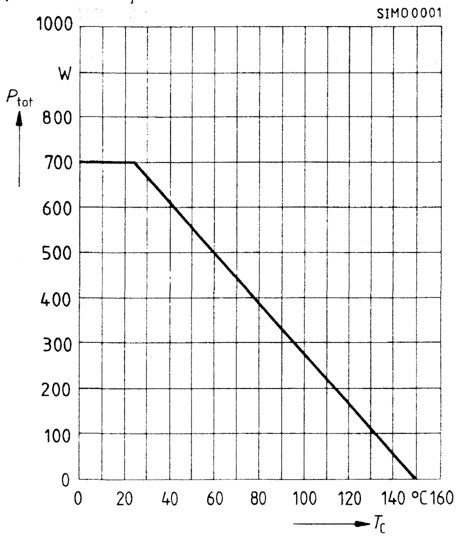
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	50	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 50 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 200 A	$R_{DS(on)}$	–	2.6	3.0	mΩ
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)\,max.}$, I_D = 200 A	g_{fs}	156	200	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	18	24	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	9	12	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	3	4	
Turn-on Time t_{on} ($t_{on} = t_{d\,(on)} + t_r$) V_{CC} = 40 V, V_{GS} = 10 V I_D = 200 A, R_G = 3.3 Ω	$t_{d\,(on)}$	–	280	–	ns
	t_r	–	220	–	
Turn-off Time t_{off} ($t_{off} = t_{d\,(off)} + t_f$) V_{CC} = 40 V, V_{GS} = 10 V I_D = 200 A, R_G = 3.3 Ω	$t_{d\,(off)}$	–	220	–	
	t_f	–	60	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

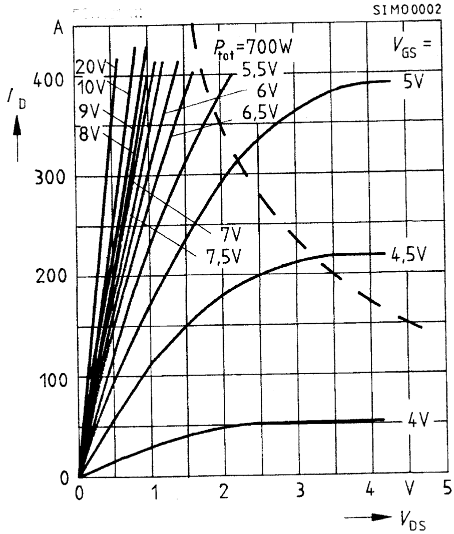
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	200	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	600	
Diode forward on-voltage I_F = 400 A , V_{GS} = 0	V_{SD}		1.25	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/µs, V_R = 30 V	t_{rr}		400	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/µs, V_R = 30 V	Q_{rr}		3.5		µC

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

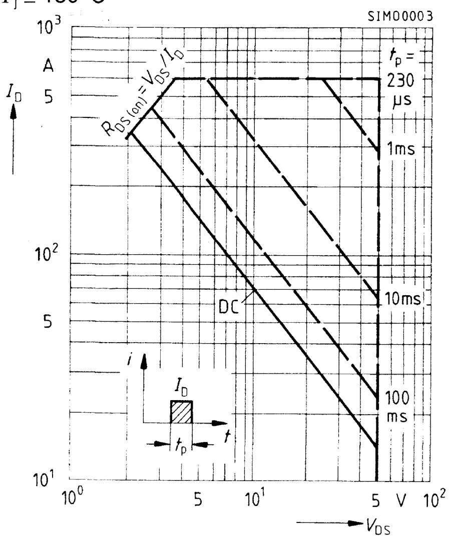
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



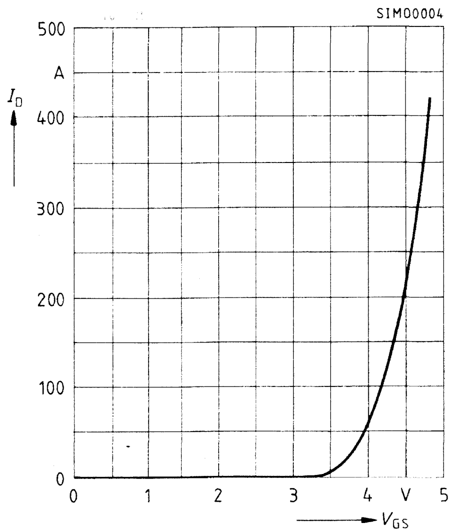
Typ. output characteristics $I_D = f(V_{DS})$
parameter: = 80 µs pulse test



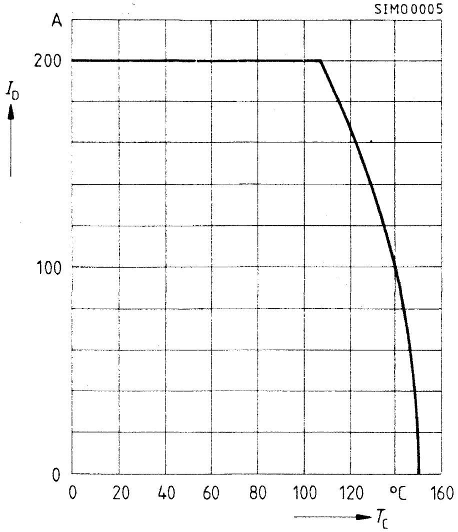
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C,
T_j ≤ 150 °C



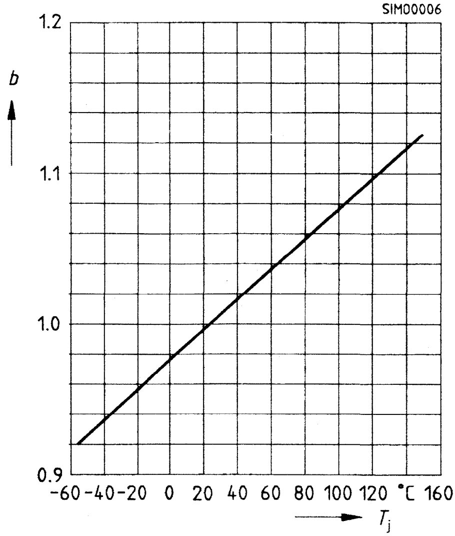
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: = 80 µs pulse test, V_{DS} = 25 V



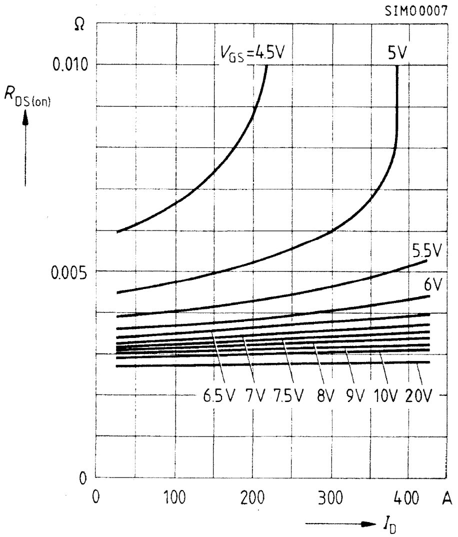
Continuous drain-source current
$I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, $T_j = 150$ °C



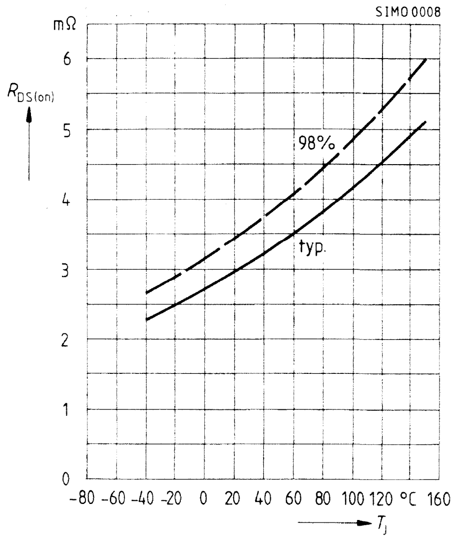
Drain-source breakdown voltage
$V_{(BR)DSS} = b \times V_{(BR)DSS}$ **(25 °C)**



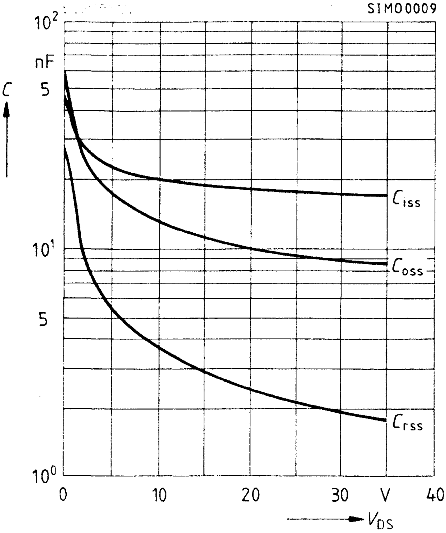
Drain source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}



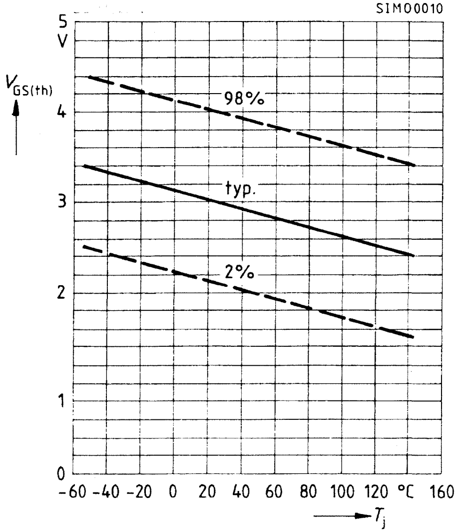
Drain source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $I_D = 200$ A; $V_{GS} = 10$ V



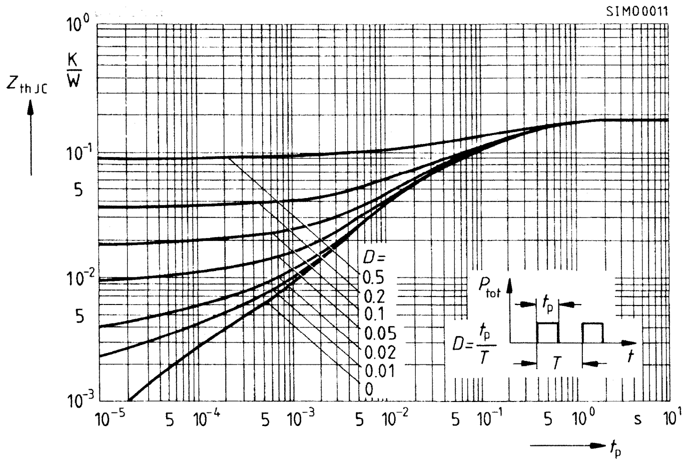
Typ. capacitances $C = f(V_{DS})$
parameter: V_{GS} = 0, f = 1 MHz



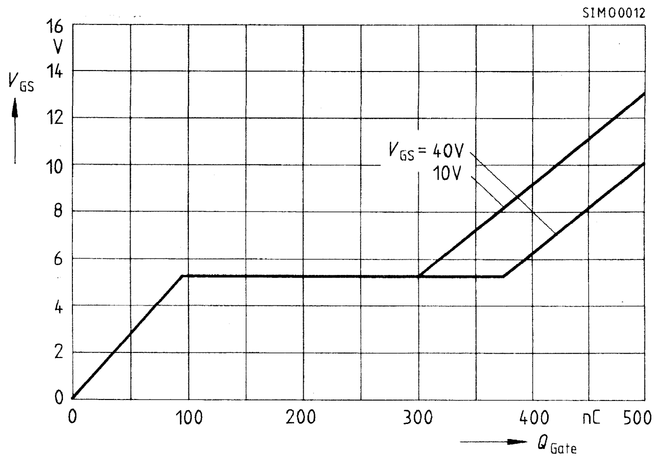
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = V_{GS}$, I_D = 1 mA
(spread)



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 330 A

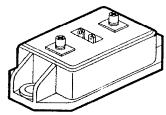


SIEMENS

SIMOPAC® Module **BSM 111 AR**

V_{DS} = **100 V**
I_D = **200 A**
$R_{DS(on)}$ = **8.5 mΩ**

- Power module
- Single switch
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1)]



VM105169

Type	Ordering Code
BSM 111 AR	C67076-S1013-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	100	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	100	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	200	A
Pulsed drain current, T_C = 25 °C	$I_{D\,puls}$	600	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	700	W
Thermal resistance Chip-case	R_{thJC}	≤ 0.18	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

[1)] See chapter Package Outline and Circuit Diagrams.
[2)] Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

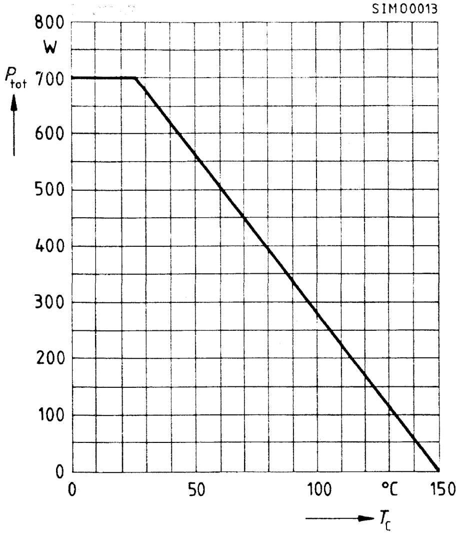
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	100	–	–	V
Gate threshold voltage $V_{DS} = V_{GS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 100 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	– –	50 300	250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 130 A	$R_{DS(on)}$	–	7	8.5	mΩ
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)\,max.}$, I_D = 130 A	g_{fs}	60	75	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	10	13	nF
Output capacitance V_{GS} = 0 , V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	5	7.5	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	1.8	2.7	
Turn-on time t_{on} ($t_{on} = t_{d\,(on)} + t_r$) V_{CC} = 50 V, V_{GS} = 10 V I_D = 130 A, R_{GS} = 3.3 Ω	$t_{d\,(on)}$	–	280	–	ns
	t_r	–	220	–	
Turn-off time t_{off} ($t_{off} = t_{d\,(off)} + t_f$) V_{CC} = 50 V, V_{GS} = 10 V I_D = 130 A, R_{GS} = 3.3 Ω	$t_{d\,(off)}$	–	220	–	
	t_f	–	60	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

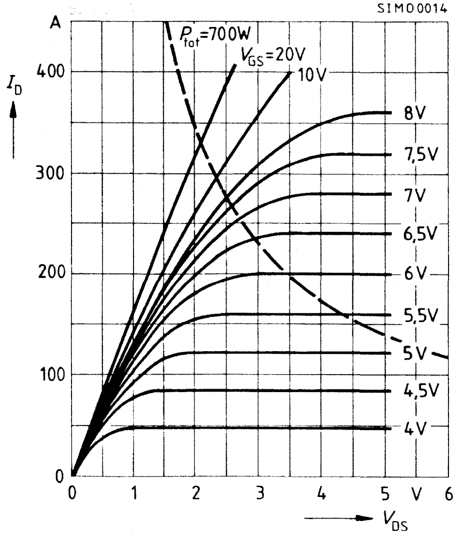
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	200	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	600	
Diode forward on-voltage I_F = 400 A , V_{GS} = 0	V_{SD}	–	1.25	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 30 V	t_{rr}	–	400	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 30 V	Q_{rr}	–	3.5		µC

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

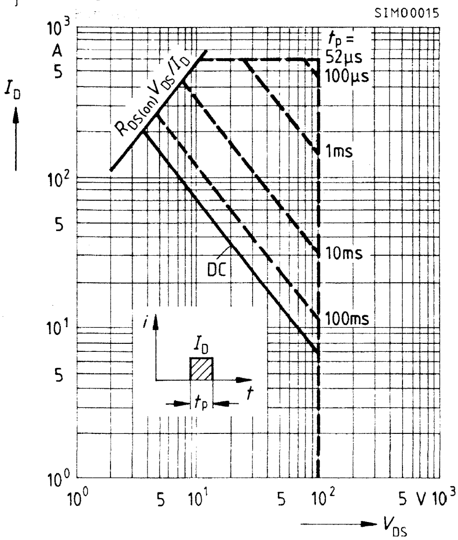
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



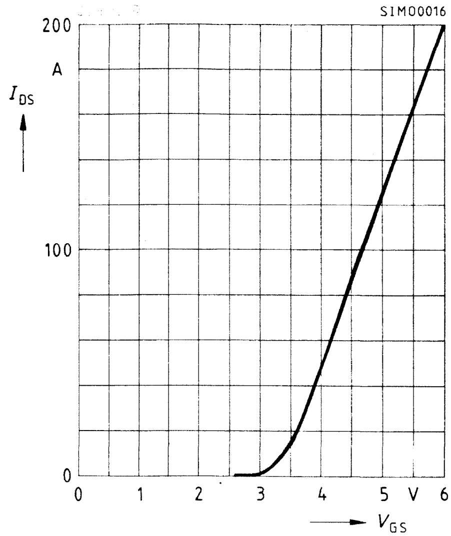
Typ. output characteristics $I_D = f(V_{DS})$
parameter: = 80 µs pulse test



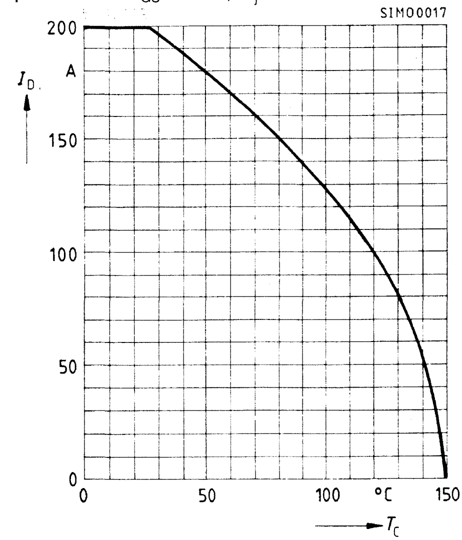
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



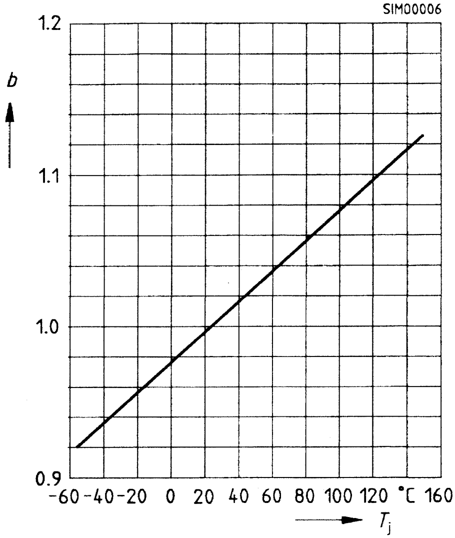
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: = 80 µs pulse test, V_{DS} = 25 V



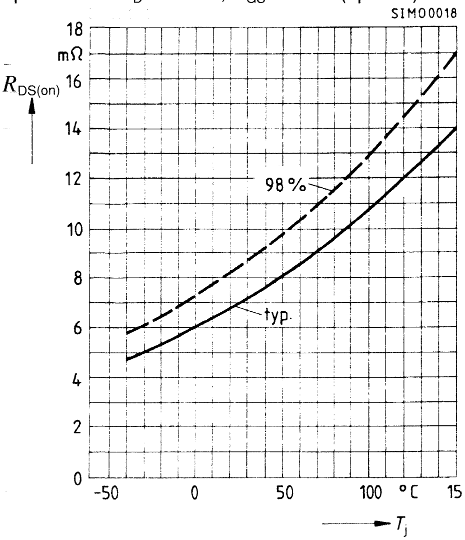
Continuous drain-source current
$I_D = f(T_C)$,
parameter: $V_{GS} \geq 10$ V, $T_j = 150$ °C



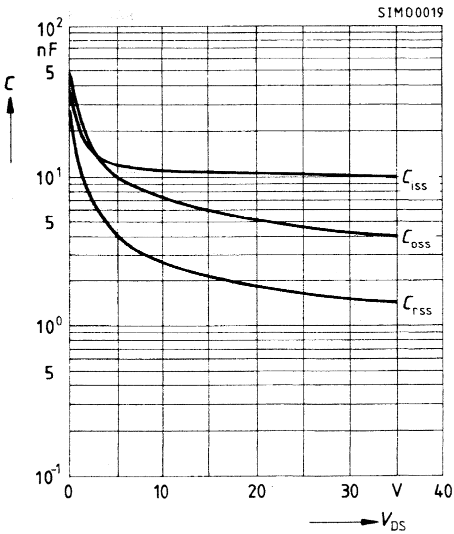
Drain-source breakdown voltage
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}$ (25 °C)



Drain source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $I_D = 130$ A; $V_{GS} = 10$ V (spread)



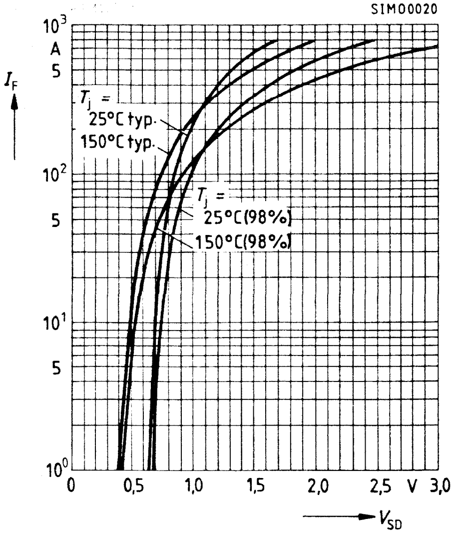
Typical capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz



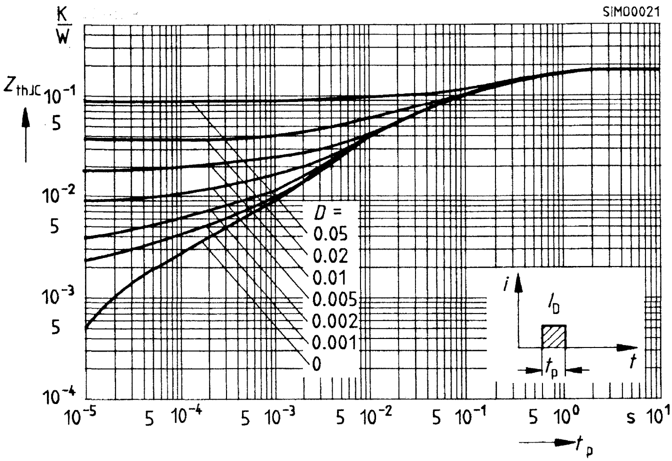
Forward characteristics of reverse diode

$I_F = f(V_{SD})$

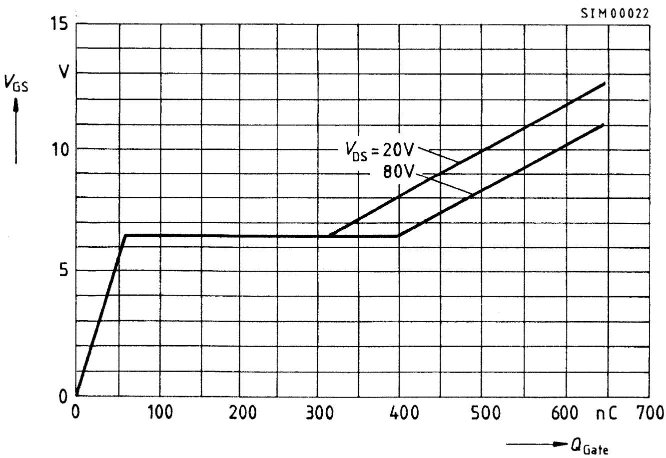
parameter: T_j, t_p = 80 µs (spread)



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dputs} = 300 A

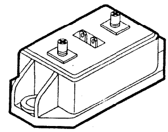


SIEMENS

SIMOPAC® Module **BSM 121 AR**

V_{DS} = **200 V**
I_D = **130 A**
$R_{DS(on)}$ = **20 mΩ**

- Power module
- Single switch
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1]



Type	Ordering Code
BSM 121 AR	C67076-S1014-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	200	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	200	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 ˚C	I_D	130	A
Pulsed drain current, T_C = 25 ˚C	$I_{D\ puls}$	390	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	˚C
Power dissipation, T_C = 25 ˚C	P_{tot}	700	W
Thermal resistance Chip-case Case-heat sink	 $R_{th\ JC}$ $R_{th\ CH}$	 ≤ 0.18 ≤ 0.05	K/W
Insulation test voltage[2], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

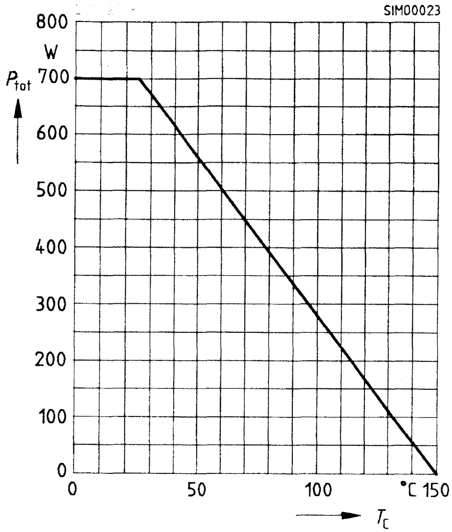
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	200	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 200 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 80 A	$R_{DS(on)}$	–	18	20	mΩ
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 80 A	g_{fs}	60	75	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	10	13	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	3	4.5	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.7	1.0	
Turn-on time t_{on} ($t_{on} = t_{d (on)} + t_r$) V_{CC} = 100 V, V_{GS} = 10 V I_D = 80 A, R_{GS} = 3.3 Ω	$t_{d (on)}$	–	120	–	ns
	t_r	–	60	–	
Turn-off time t_{off} ($t_{off} = t_{d (off)} + t_f$) V_{CC} = 100 V, V_{GS} = 10 V I_D = 80 A, R_{GS} = 3.3 Ω	$t_{d (off)}$	–	240	–	
	t_f	–	40	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

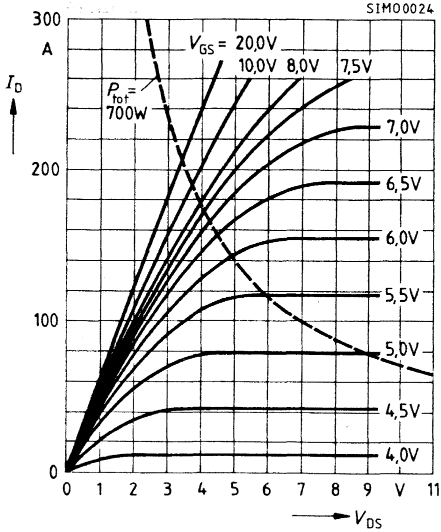
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	130	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	390	
Diode forward on-voltage I_F = 260 A , V_{GS} = 0	V_{SD}	–	1.05	1.4	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	t_{rr}	–	400	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	Q_{rr}	–	4.3	–	µC

Characteristics at T_j = 25 ˚C, unless otherwise specified.

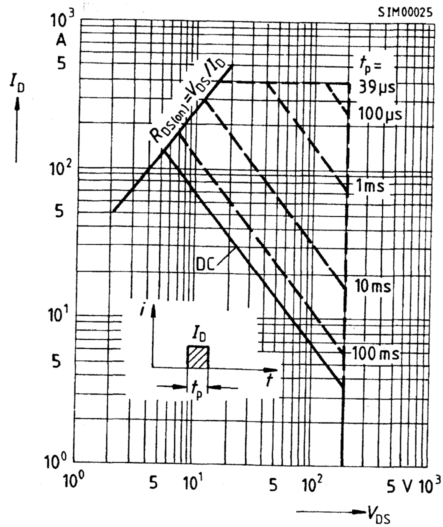
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 ˚C



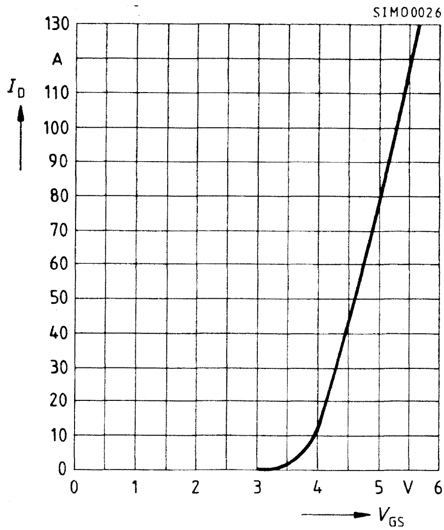
Typ. output characteristics $I_D = f(V_{DS})$
parameter: = 80 µs pulse test



Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 ˚C
$T_j \leq$ 150 ˚C



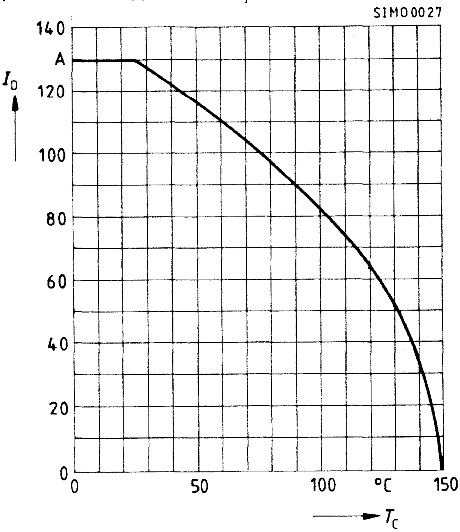
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: = 80 µs pulse test, V_{DS} = 25 V



Continuous drain-source current

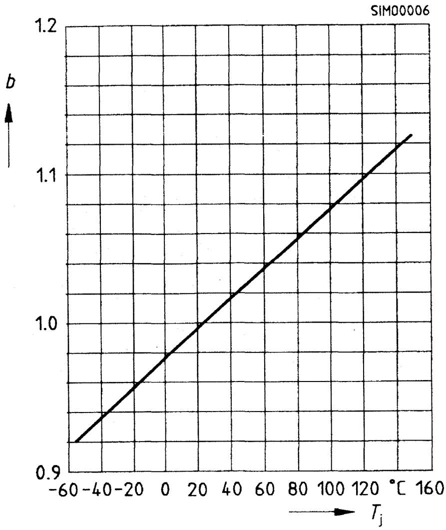
$I_D = f(T_C)$

parameter: $V_{GS} \geq 10$ V, $T_j = 150$ °C



Drain-source breakdown voltage

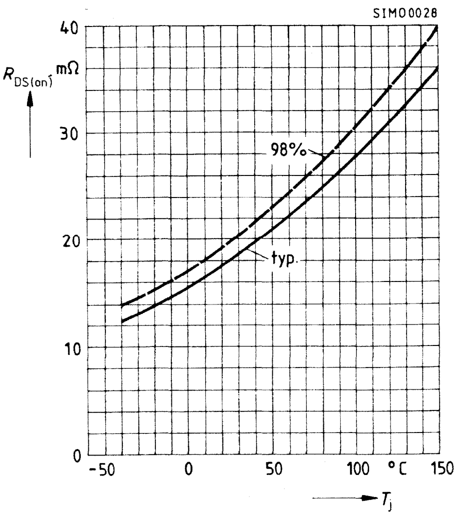
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}(25\,°C)$



Drain source on-state resistance

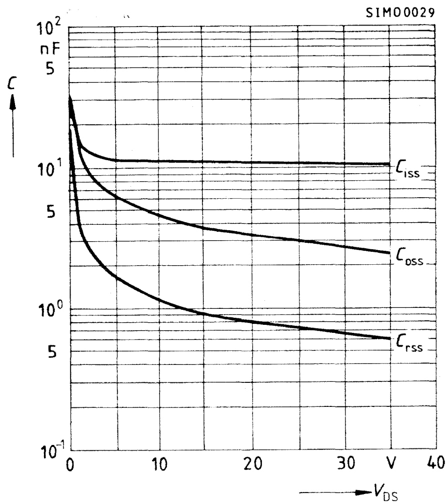
$R_{DS(on)} = f(T_j)$

parameter: $I_D = 80$ A; $V_{GS} = 10$ V (spread)



Typical capacitances $C = f(V_{DS})$

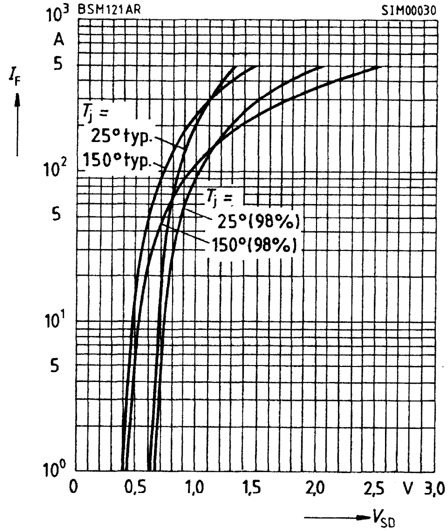
parameter: $V_{GS} = 0$, $f = 1$ MHz



Forward characteristics of reverse diode

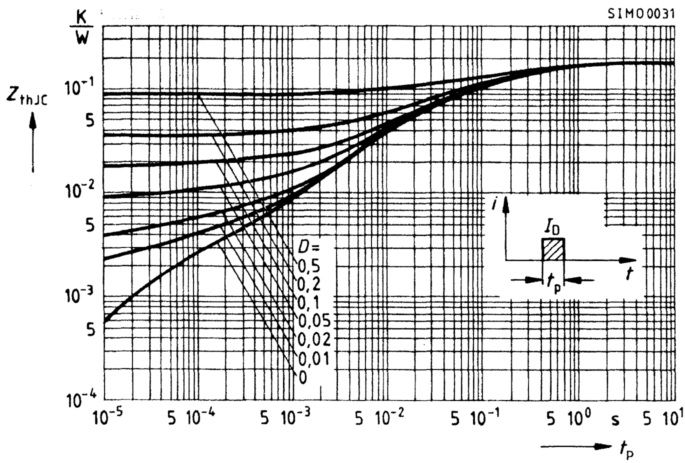
$I_F = f(V_{SD})$

parameter: T_j, t_p = 80 µs (spread)

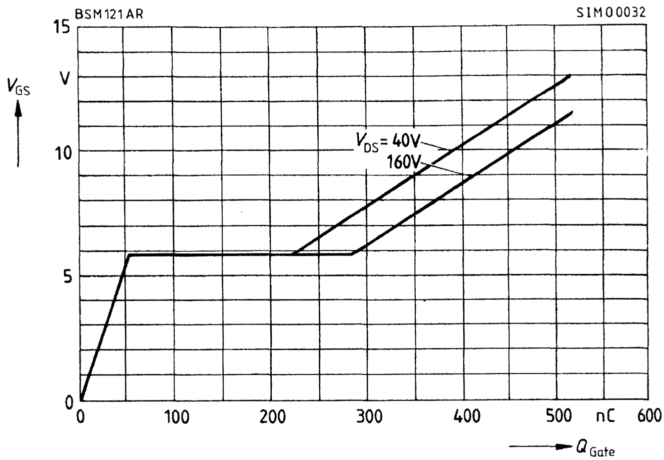


Transient thermal impedance $Z_{thJC} = f(t_p)$

parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{gate})$
parameter: I_{Dpuls} = 200 A



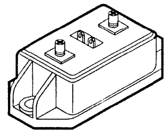
SIEMENS

SIMOPAC® Module

BSM 141

V_{DS} = 400 V
I_D = 60 A
$R_{DS(on)}$ = 0.075 Ω

- Power module
- Single switch
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1)]


VM105169

Type	Ordering Code
BSM 141	C67076-A1010-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	400	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	400	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	60	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	240	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	625	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.2	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

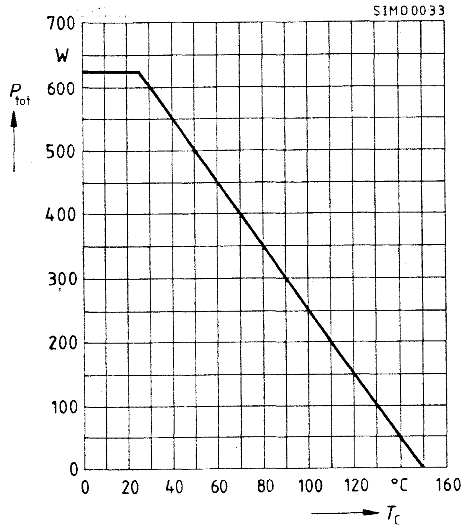
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	400	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 400 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 39 A	$R_{DS(on)}$	–	0.06	0.075	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 39 A	g_{fs}	30	45	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	8	10.5	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	1.5	2	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.6	0.7	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 200 V, V_{GS} = 10 V I_D = 40 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	36	–	ns
	t_r	–	25	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 200 V, V_{GS} = 10 V I_D = 40 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	260	–	
	t_f	–	50	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

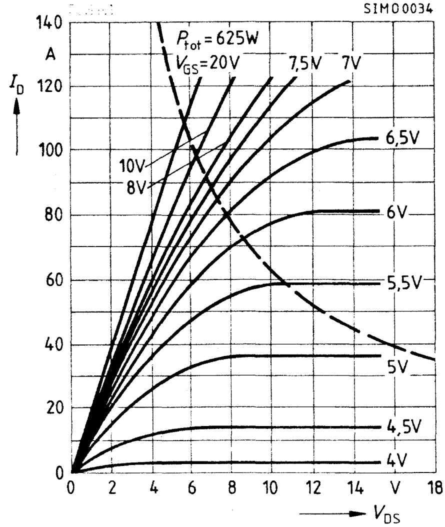
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	60	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	240	
Diode forward on-voltage I_F = 120 A , V_{GS} = 0	V_{SD}	–	1.1	1.4	V

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

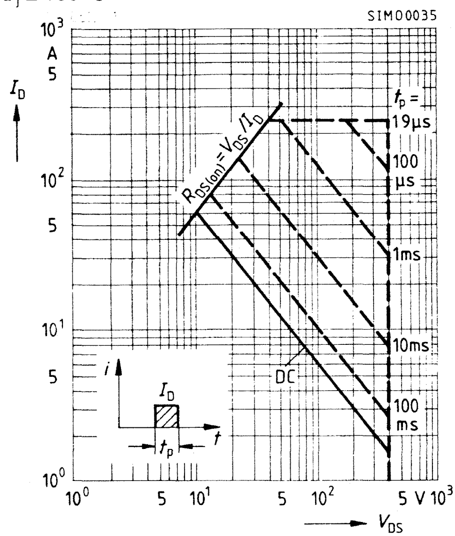
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



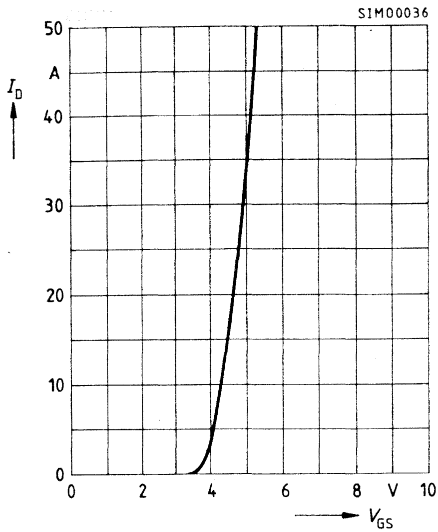
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



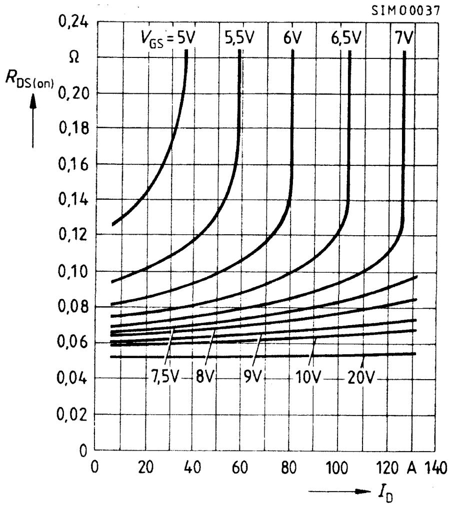
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



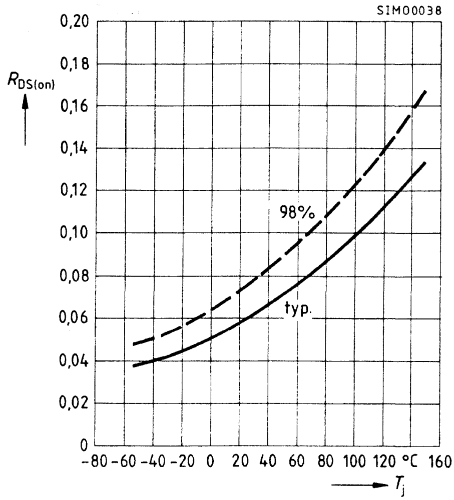
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs, V_{DS} = 25 V



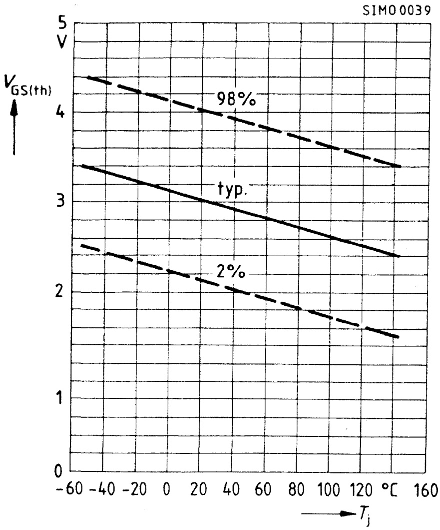
Typ. on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}



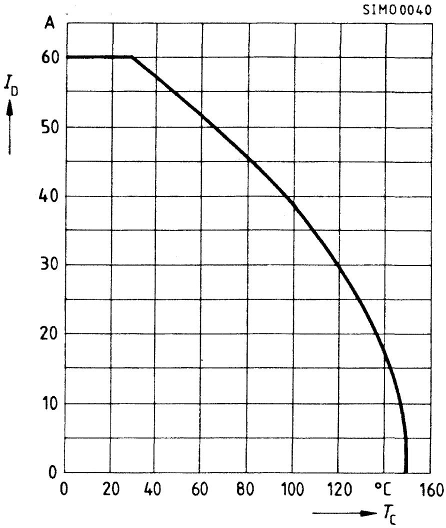
On-state resistance
$R_{DS(on)} = f(T_j)$
parameter: I_D = 39 A; V_{GS} = 10 V (spread)



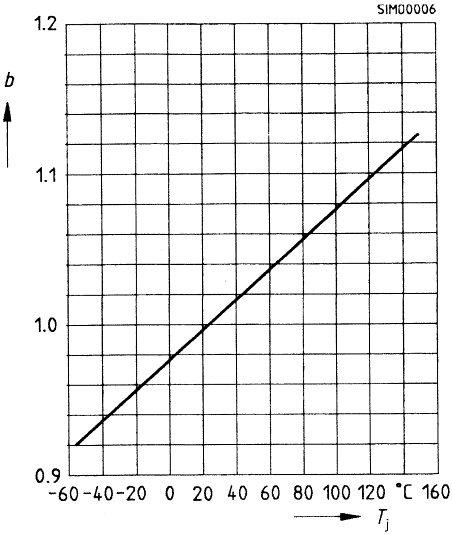
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = V_{GS}$, I_D = 1mA (spread)



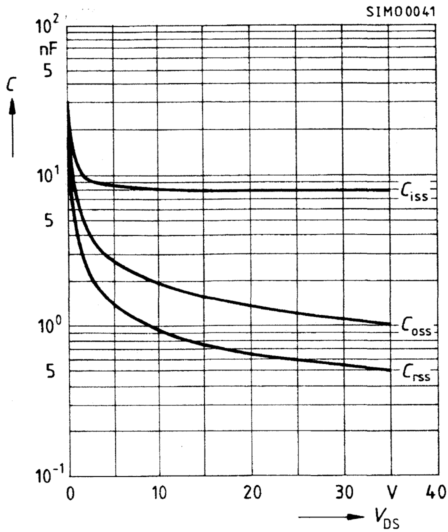
Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq$ 10 V, T_j = 150 °C



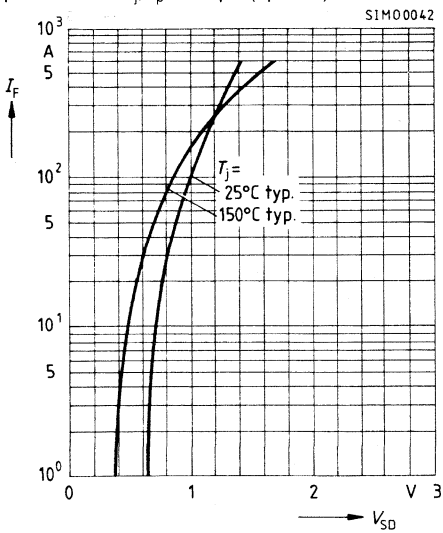
Drain-source breakdown voltage
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}$ (25 °C)



Typ. capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0, f = 1$ MHz (spread)



Forward characteristics of reverse diode
$I_F = f(V_{SD})$
parameter: T_j, t_p = 80 µs (spread)

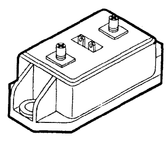


SIEMENS

SIMOPAC® Module — BSM 151

V_{DS} = 500 V
I_D = 48 A
$R_{DS(on)}$ = 0.12 Ω

- Power module
- Single switch
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1)]



Type	Ordering Code
BSM 151	C67076-A1004-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	500	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	500	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	48	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	192	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	625	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.20	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

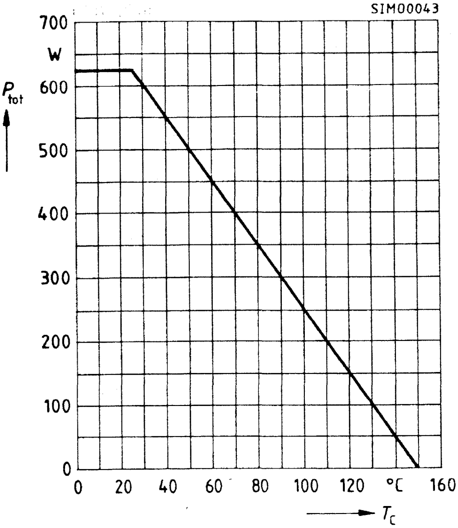
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	500	–	–	V
Gate threshold voltage $V_{DS} = V_{GS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 500 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 30 A	$R_{DS(on)}$	–	0.1	0.12	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 30 A	g_{fs}	30	45	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	8	11	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	1.2	1.7	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.5	0.7	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 250 V, V_{GS} = 10 V I_D = 30 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	36	–	ns
	t_r	–	25	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 250 V, V_{GS} = 10 V I_D = 30 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	260	–	
	t_f	–	50	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

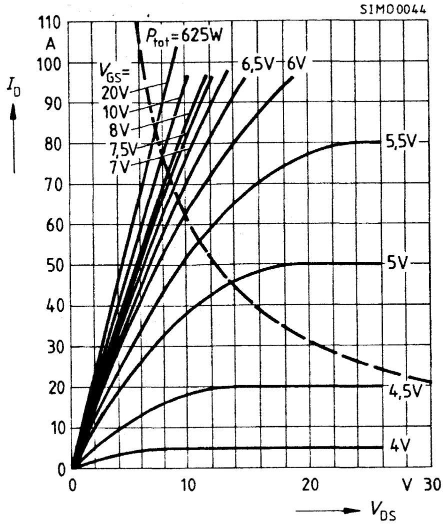
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	48	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	192	
Diode forward on-voltage I_F = 96 A , V_{GS} = 0	V_{SD}	–	1.1	1.4	V

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

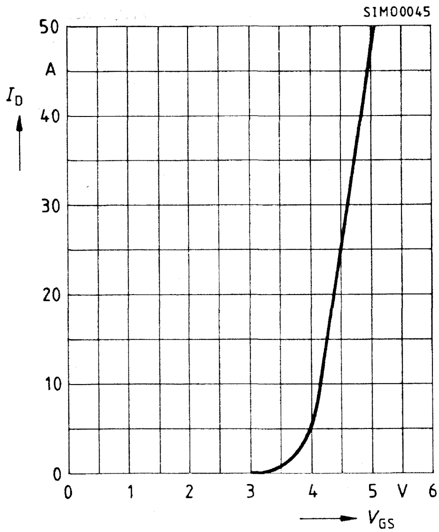
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



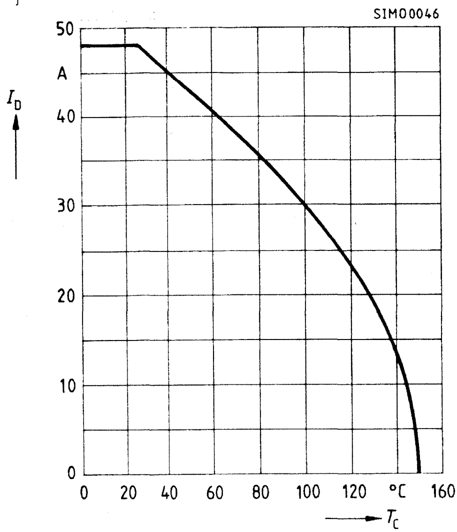
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs, V_{DS} = 25 V

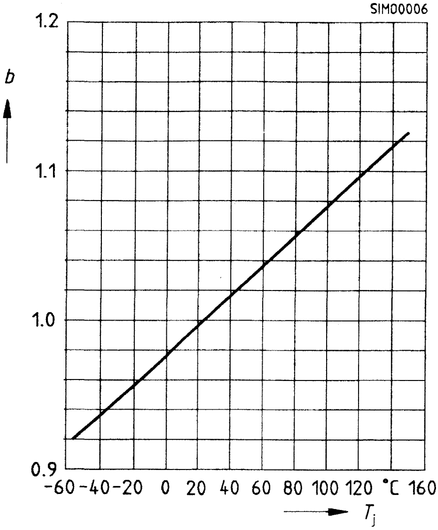


Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq$ 10 V,
T_j = 150 °C



Drain-source breakdown voltage

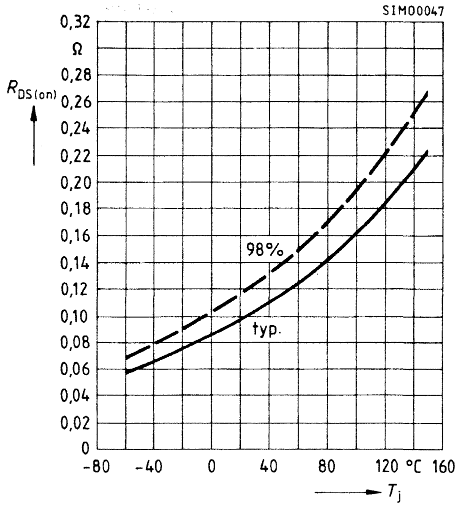
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}$ **(25 °C)**



Drain source on-resistance

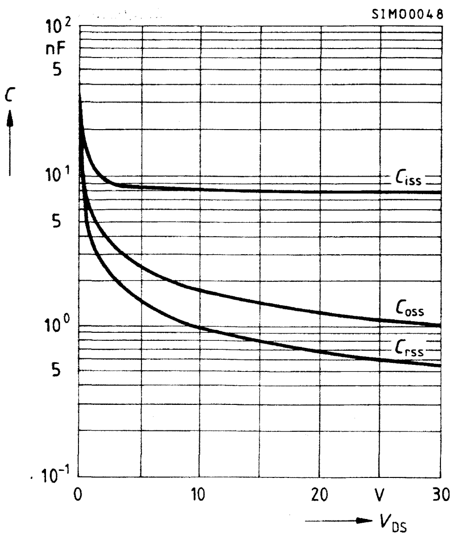
$R_{DS(on)} = f(T_j)$

parameter: I_D = 30 A; V_{GS} = 10 V, (spread)



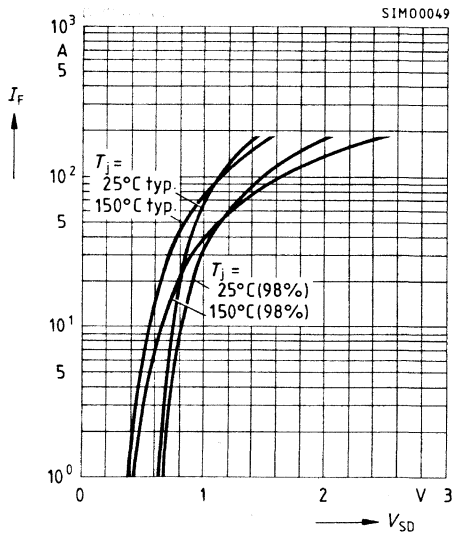
Typ. capacitances $C = f(V_{DS})$

parameter: V_{GS} = 0, f = 1 MHz

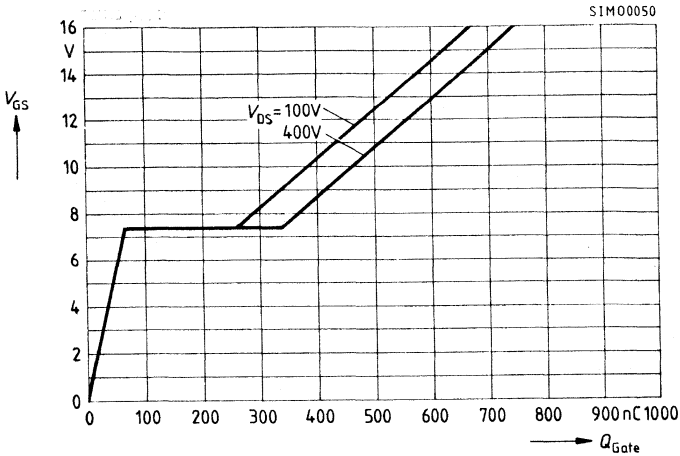


Forward characteristics of reverse diode

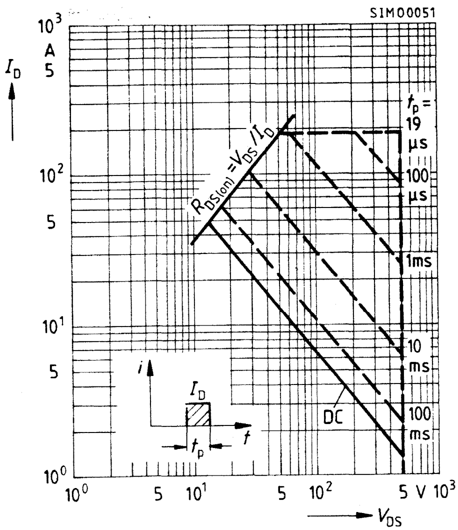
$I_F = f(V_{SD})$, parameter: T_j, t_p = 80 µs (spread)



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 63 A



Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C, T_j ≤ 150 °C



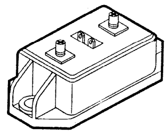
SIEMENS

SIMOPAC® Module

BSM 151 F

V_{DS} = 500 V
I_D = 56 A
$R_{DS(on)}$ = 0.11 Ω

- Power module
- Single switch
- FREDFET
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1)]



Type	Ordering Code
BSM 151 F	C67076-A1050-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	500	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	500	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 32 ˚C	I_D	56	A
Pulsed drain current, T_C = 32 ˚C	$I_{D\ puls}$	224	
Operating and storage temperature range	T_j, T_{stg}	– 55 … + 150	˚C
Power dissipation, T_C = 25 ˚C	P_{tot}	700	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.18	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

[1)] See chapter Package Outline and Circuit Diagrams.
[2)] Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

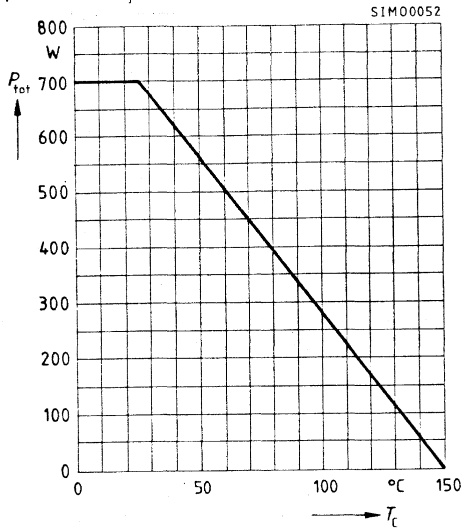
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	500	–	–	V
Gate threshold voltage $V_{DS} = V_{GS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 500 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 36 A	$R_{DS(on)}$	–	0.09	0.11	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 36 A	g_{fs}	20	30	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	22	30	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	1.6	2.4	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.65	1.0	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 250 V, V_{GS} = 10 V I_D = 36 A, R_{GS} = 3.3 Ω	$t_{d(on)}$ t_r	– –	60 35	– –	ns
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 250 V, V_{GS} = 10 V I_D = 36 A, R_{GS} = 3.3 Ω	$t_{d(off)}$ t_f	– –	350 70	– –	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

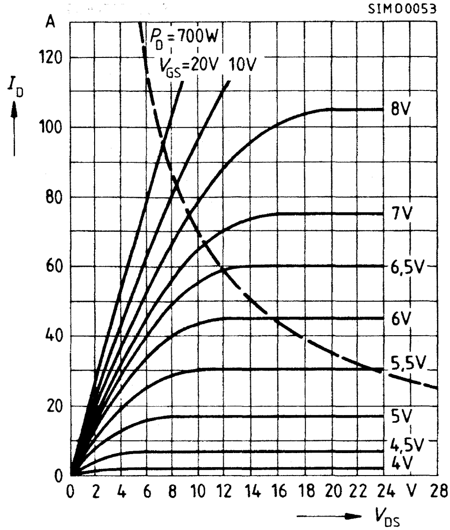
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Fast-recovery reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	56	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	224	
Diode forward on-voltage I_F = 96 A , V_{GS} = 0	V_{SD}	–	1.3	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	t_{rr}	– –	200 350	280 500	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	Q_{rr}	– –	1.5 8.5	2.5 12	µC
Repetitive peak reverse current $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	I_{RRM}	– –	12 28	– –	A

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

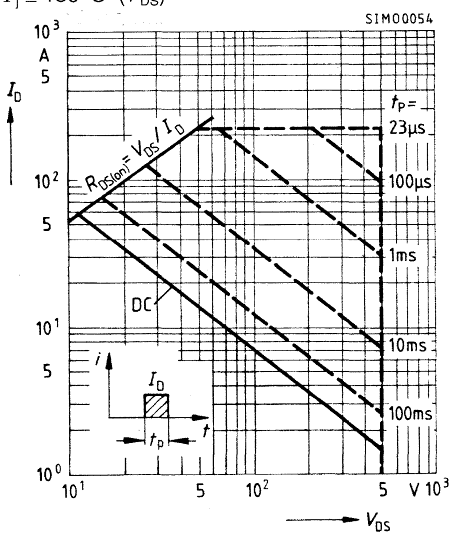
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



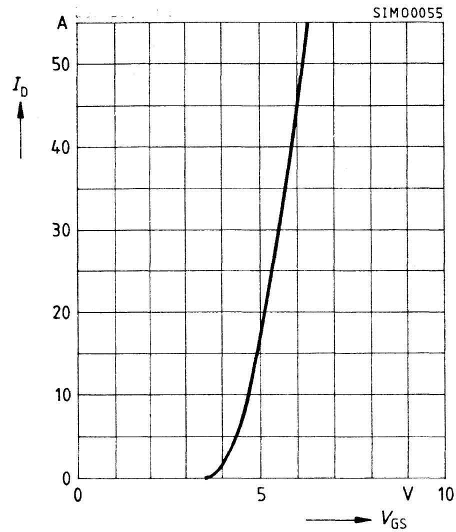
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs pulse test



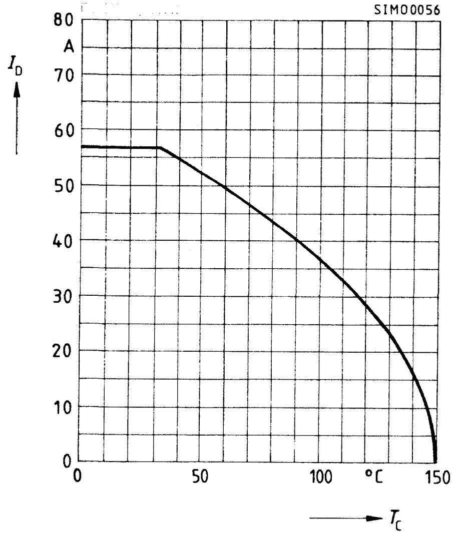
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C,
$T_j \leq$ 150 °C (V_{DS})



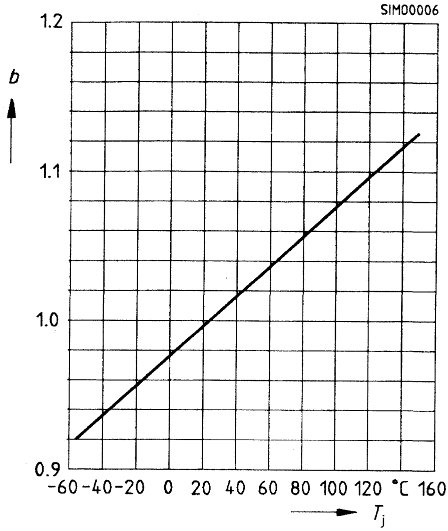
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



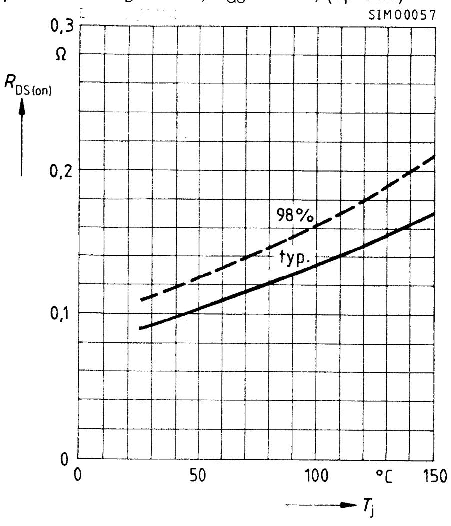
Continuous drain current
$I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, $T_j = 150$ °C



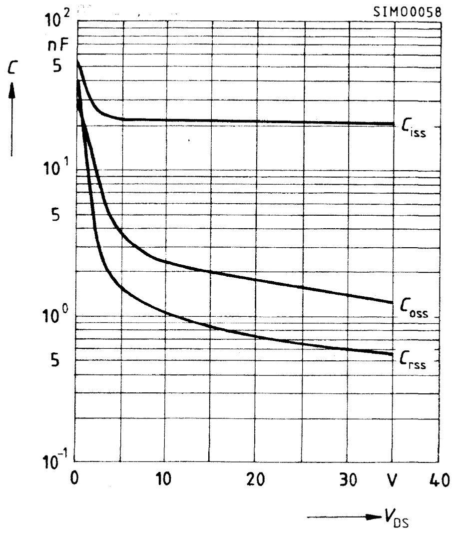
Drain-source breakdown voltage
$V_{(BR)DSS}$ (T_j) = $b \times V_{(BR)DSS}$ (25 °C)



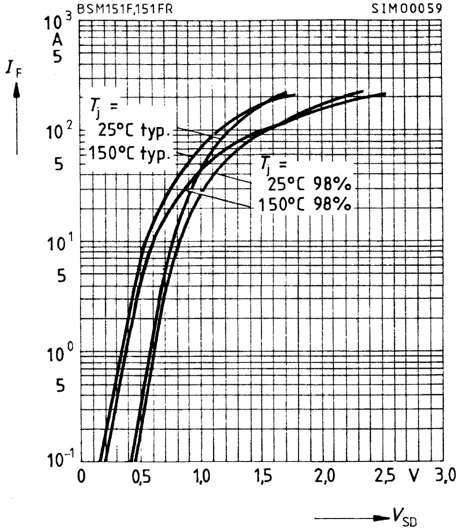
Drain source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $I_D = 36$ A; $V_{GS} = 10$ V, (spread)



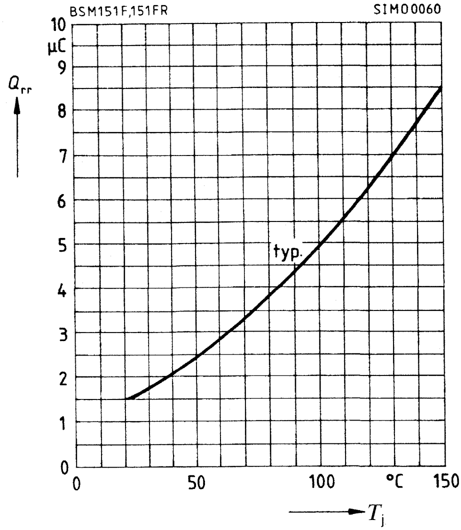
Typical capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz



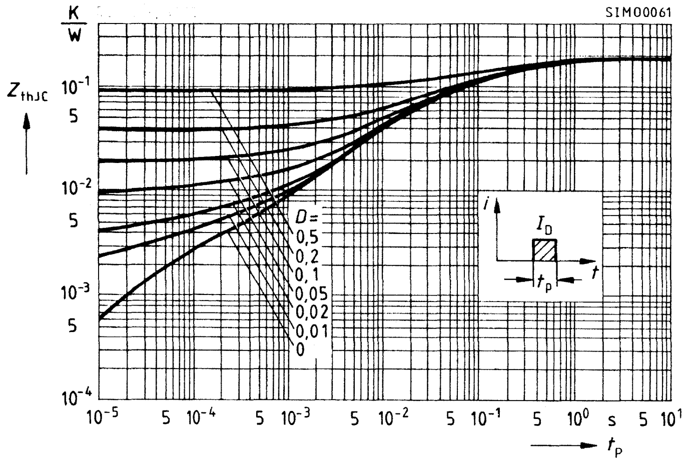
Forward characteristics of fast-recovery reverse diode $I_F = f(V_{SD})$
parameter: T_j, t_p = 80 µs (spread)



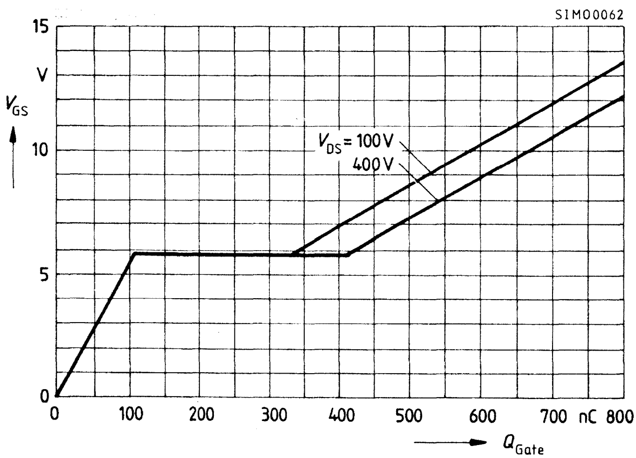
Typ. reverse recovery $Q_{rr} = f(T_j)$
parameter: di/dt = 100 A/ µs, I_F = 56 A
V_R = 100 V



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 75 A



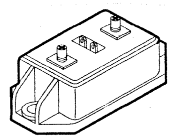
SIEMENS

SIMOPAC® Module

BSM 181
BSM 181 R

V_{DS} = 100 V
I_D = 200 A
$R_{DS(on)}$ = 8.5 mΩ

- Power module
- Single switch
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1)]


VM105169

Type	Ordering Code
BSM 181	C67076-A1001-A2
BSM 181 R	C67076-A1016-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	800	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	800	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	36	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	144	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	700	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.18	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

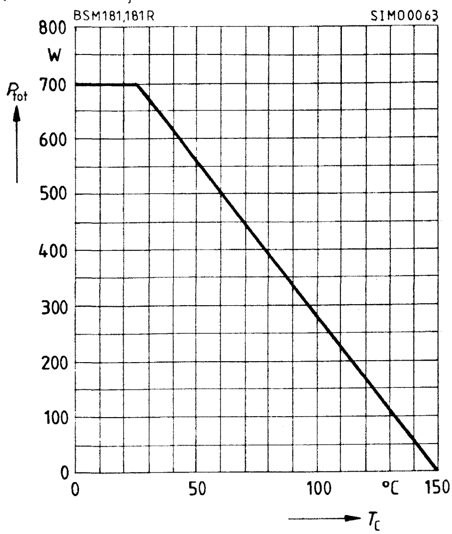
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	800	–	–	V
Gate threshold voltage $V_{DS} = V_{GS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 800 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 23 A	$R_{DS(on)}$	–	0.18	0.24	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 23 A	g_{fs}	15	25	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	24	32	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	1.3	2.0	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.5	0.8	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 400 V, V_{GS} = 10 V I_D = 23 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	60	–	ns
	t_r	–	30	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 400 V, V_{GS} = 10 V I_D = 23 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	370	–	
	t_f	–	70	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

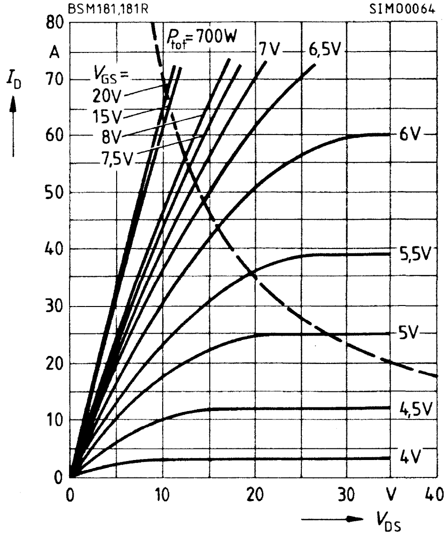
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	36	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	144	
Diode forward on-voltage I_F = 72 A , V_{GS} = 0	V_{SD}	–	1.1	1.4	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	t_{rr}	 – –	 1200 –	 – –	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	Q_{rr}	 – –	 42 50	 – –	µC

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

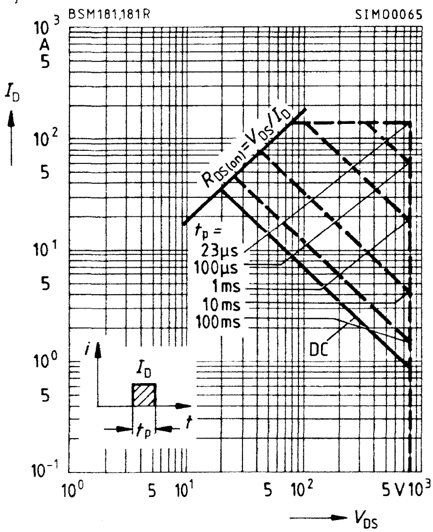
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



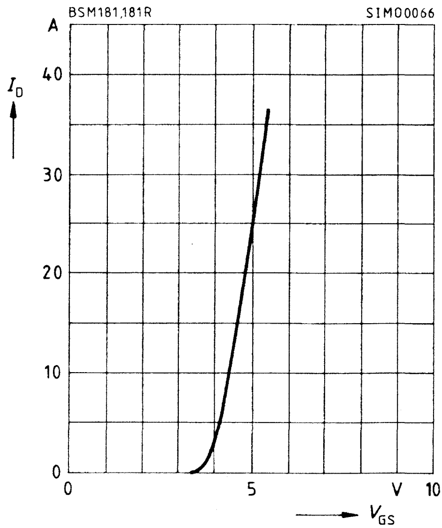
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs pulse test



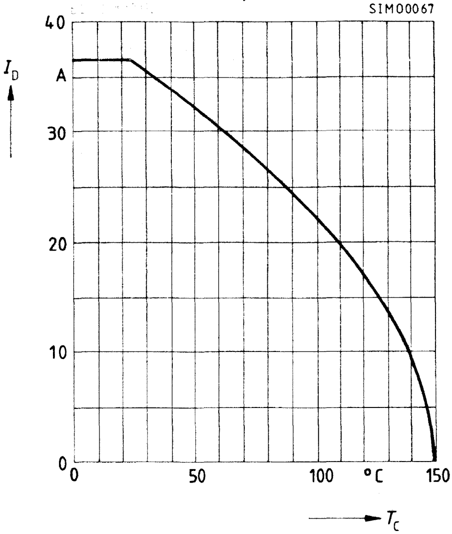
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C,
$T_j \leq$ 150 °C



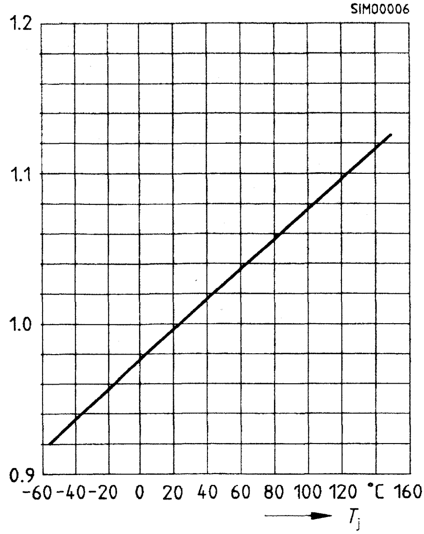
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



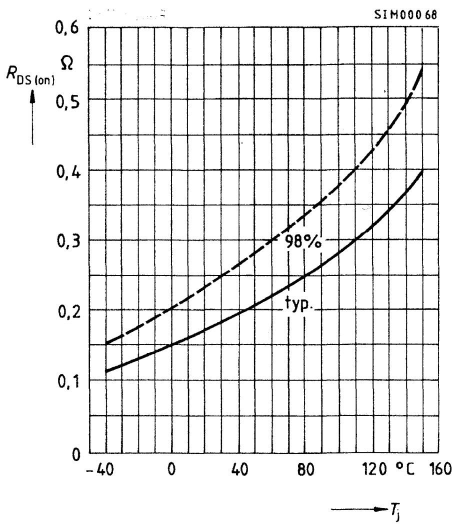
Continuous drain current
$I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, $T_j = 150$ °C



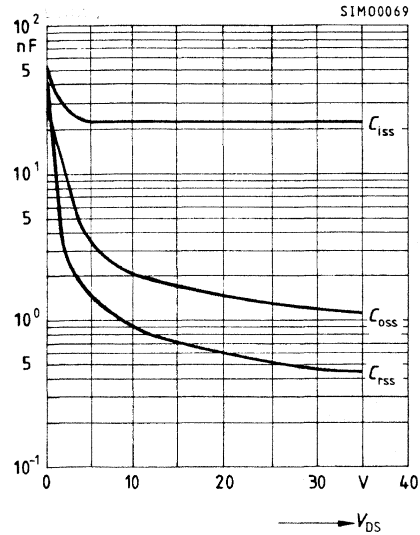
Drain-source breakdown voltage
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}$ **(25 °C)**



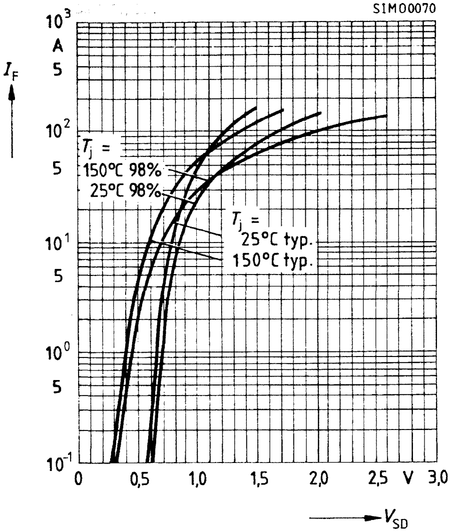
Drain source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $I_D = 36$ A; $V_{GS} = 10$ V, (spread)



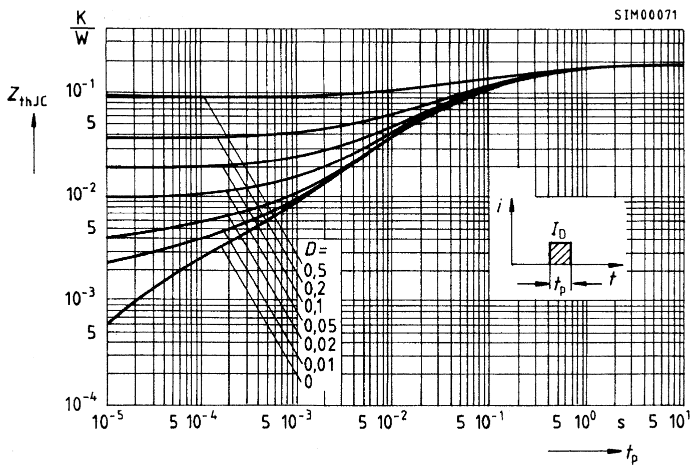
Typical capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz



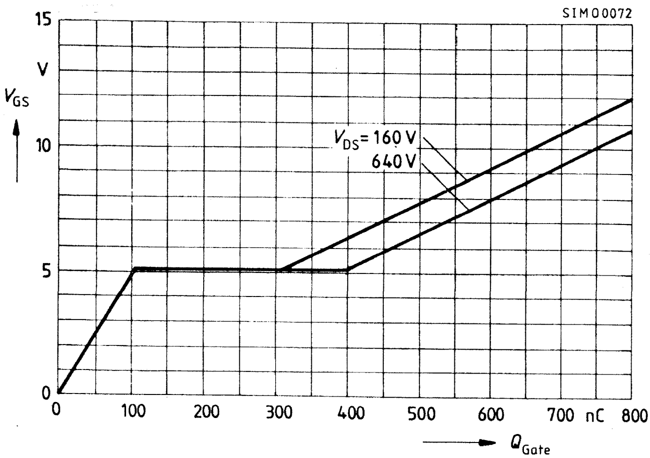
Forward characteristics of reverse diode $I_F = f\,(V_{SD})$
parameter: T_j, t_p = 80 µs (spread)



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



Typ. gate charge $V_{GS} = f\,(Q_{Gate})$
parameter: I_{Dpuls} = 52.5 A



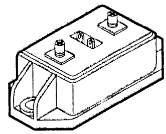
SIEMENS

SIMOPAC® Module

BSM 181 F

V_{DS} = **800 V**
I_D = **34 A**
$R_{DS(on)}$ = **0.32 Ω**

- Power module
- Single switch
- FREDFET
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1)]



Type	Ordering Code
BSM 181 F	C67076-A1052-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	800	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	800	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	34	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	136	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	700	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.18	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

[1)] See chapter Package Outline and Circuit Diagrams.
[2)] Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

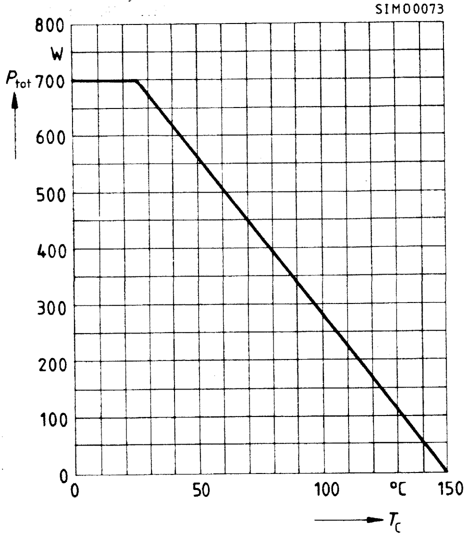
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	800	–	–	V
Gate threshold voltage $V_{GS} = V_{DS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 800 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 20 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 21 A	$R_{DS(on)}$	–	0.25	0.32	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 21 A	g_{fs}	15	35	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	22	30	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	1	1.5	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.48	0.8	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 400 V, V_{GS} = 10 V I_D = 21 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	60	–	ns
	t_r	–	90	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 400 V, V_{GS} = 10 V I_D = 21 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	350	–	
	t_f	–	70	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

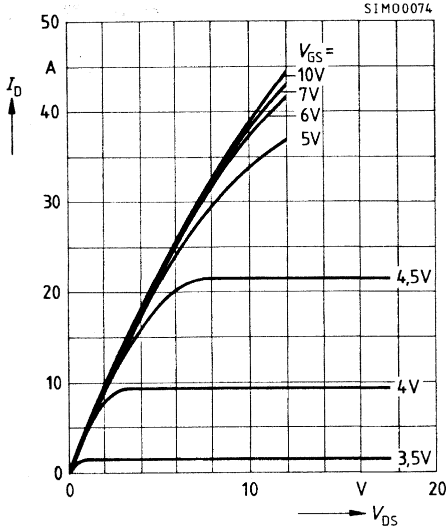
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Fast-recovery reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	34	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	136	
Diode forward on-voltage I_F = 68 A , V_{GS} = 0	V_{SD}	–	1.6	2	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	t_{rr}		300	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	Q_{rr}	 – –	 3 16	 – –	µC

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

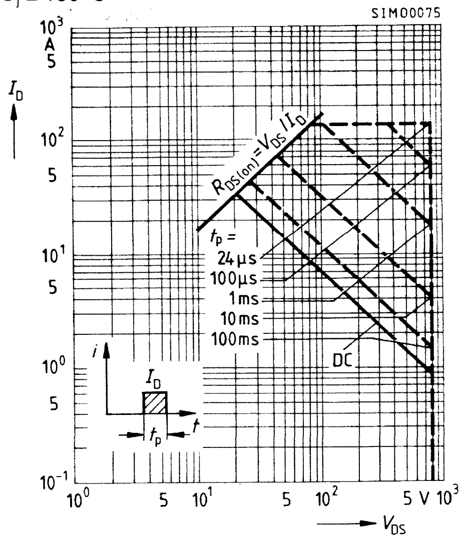
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



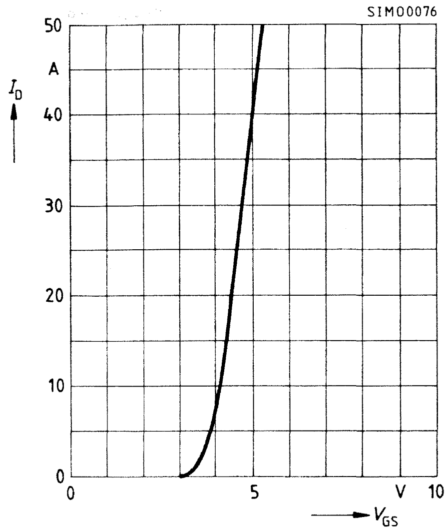
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



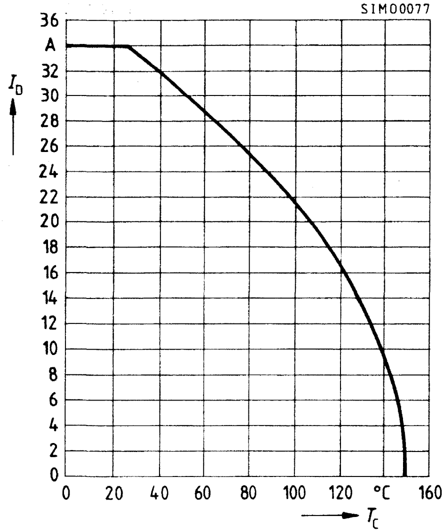
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C,
$T_j \leq$ 150 °C



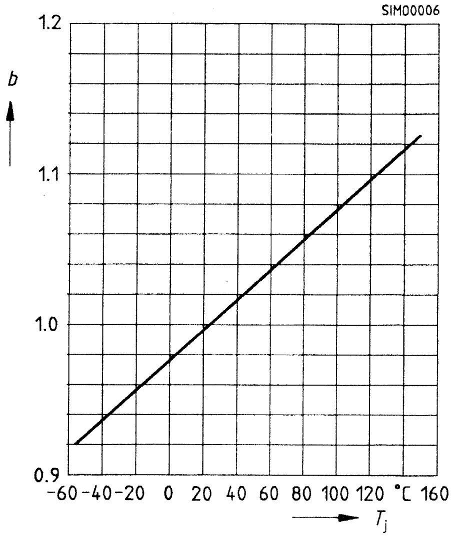
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



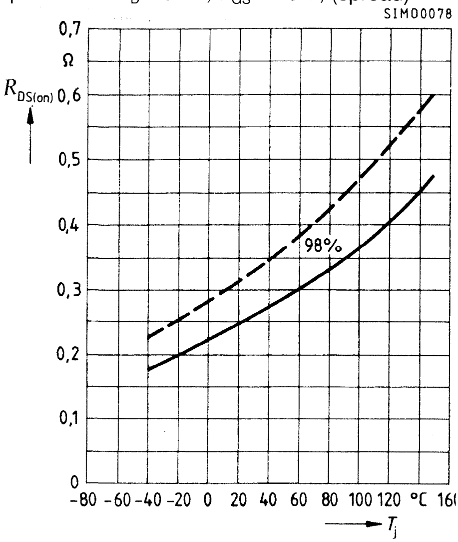
Continuous drain current
$I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, $T_j = 150$ °C



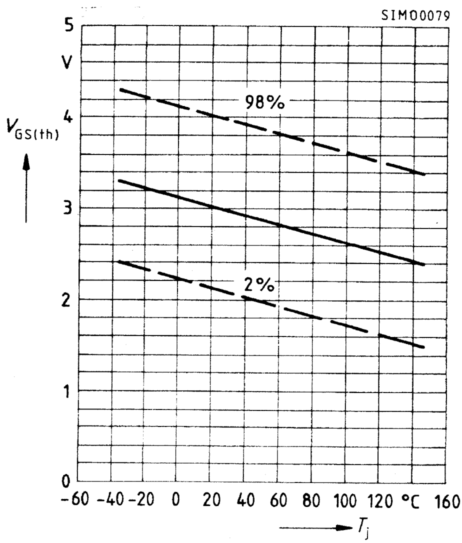
Drain-source breakdown voltage
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}(25\ °C)$



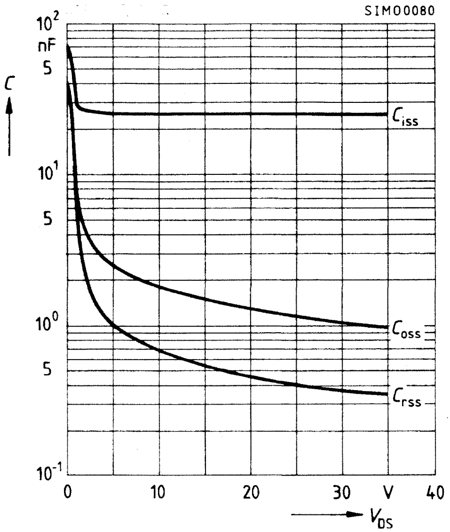
Drain source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $I_D = 34$ A; $V_{GS} = 10$ V, (spread)



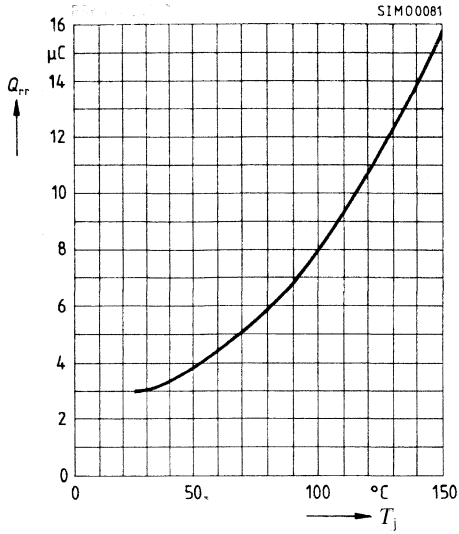
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = V_{GS}$, $I_D = 1$ mA



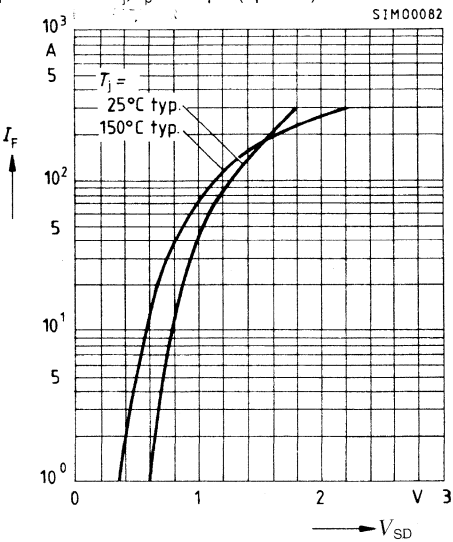
Typ. capacitances $C = f(V_{DS})$
parameter: V_{GS} = 0, f = 1 MHz (spread)



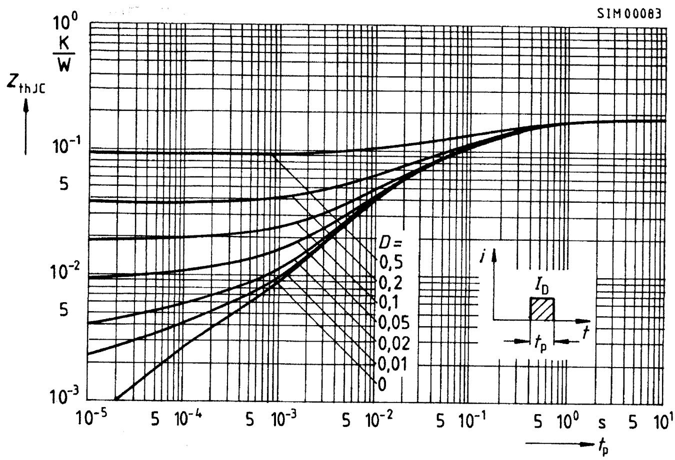
Typ. reverse recovery charge $Q_{rr} = f(T_j)$
parameter: di/dt = 100 A/ µs, I_F = 34 A
V_R = 100 V



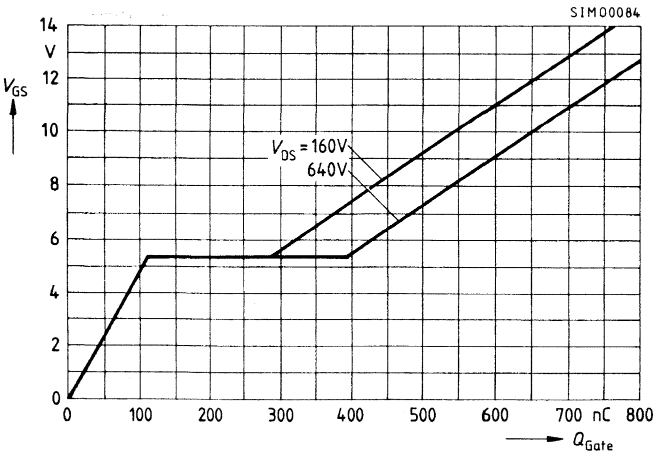
Forward characteristics of fast-recovery reverse diode $I_F = f(V_{SD})$
parameter: T_j, t_p = 80 µs (spread)



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



Typ. gate charge $V_{GS} = f\,(Q_{Gate})$
parameter: I_{Dpuls} = 51 A



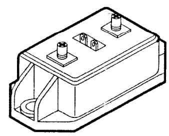
SIEMENS

SIMOPAC® Module

BSM 191

V_{DS} = 1000 V
I_D = 28 A
$R_{DS(on)}$ = 0.37 Ω

- Power module
- Single switch
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1)]



Type	Ordering Code
BSM 191	C67076-A1009-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	1000	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	1000	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	28	A
Pulsed drain current, T_C = 25 °C	$I_{D\,puls}$	112	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	700	W
Thermal resistance Chip-case	$R_{th\,JC}$	≤ 0.18	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

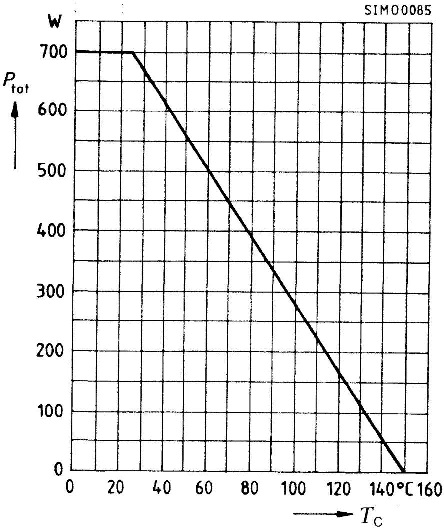
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	1000	–	–	V
Gate threshold voltage $V_{GS} = V_{DS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 1000 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	– –	50 300	250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 18 A	$R_{DS(on)}$	–	0.33	0.37	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 18 A	g_{fs}	15	22	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	22	30	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	1	1.5	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.48	0.8	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 500 V, V_{GS} = 10 V I_D = 18 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	60	–	ns
	t_r	–	30	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 500 V, V_{GS} = 10 V I_D = 18 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	350	–	
	t_f	–	60	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

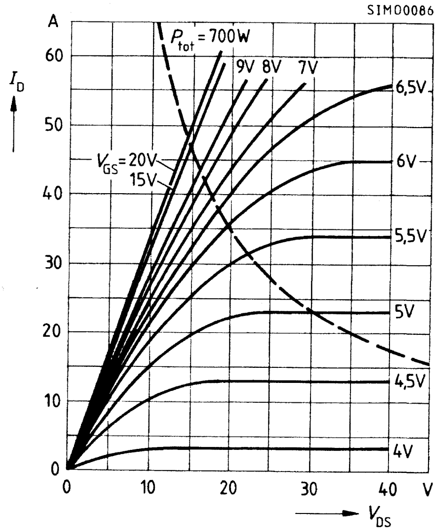
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	28	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	112	
Diode forward on-voltage I_F = 56 A , V_{GS} = 0	V_{SD}	–	1.15	1.4	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	t_{rr}	–	2	–	µs
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	Q_{rr}	–	30	–	µC

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

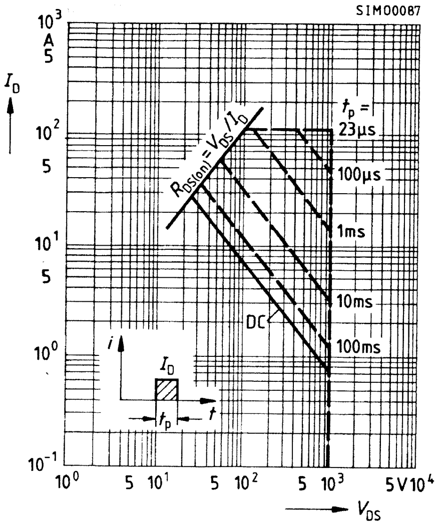
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



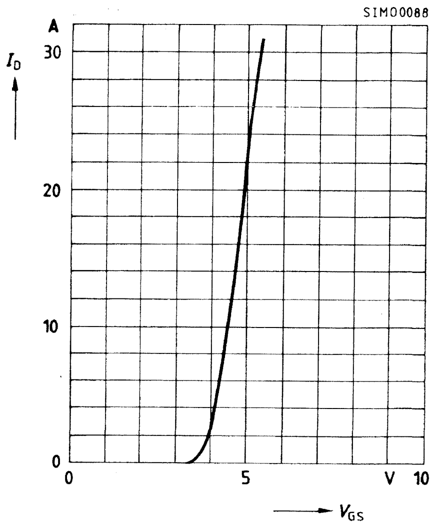
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



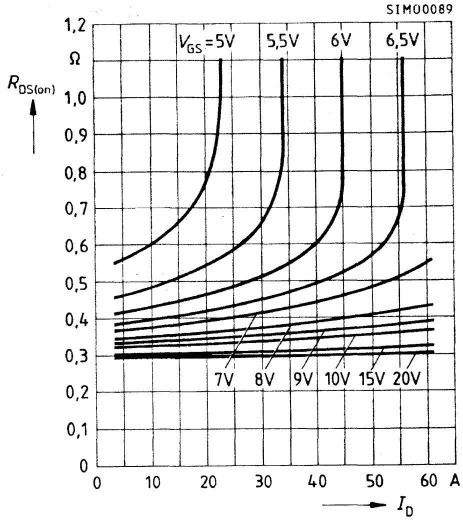
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



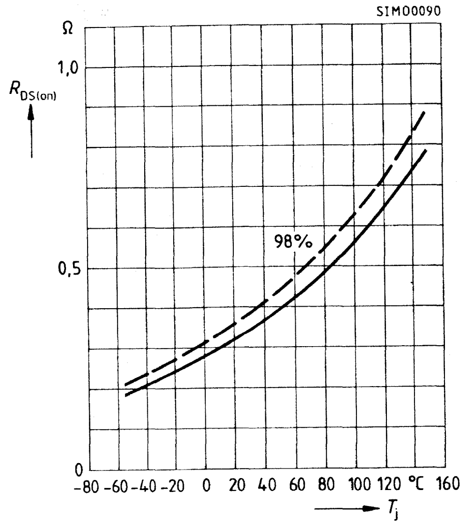
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



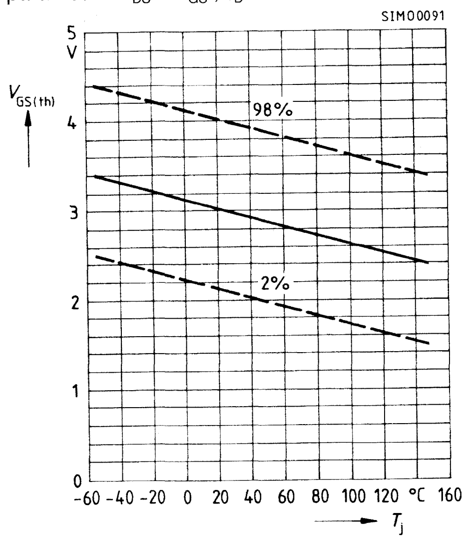
Typ. drain-source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}



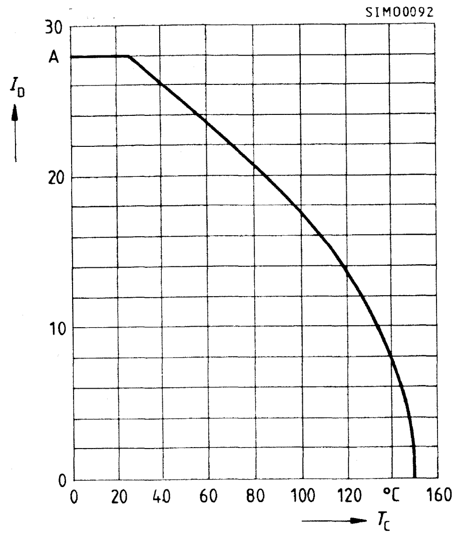
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: I_D = 18 A; V_{GS} = 10 V, (spread)



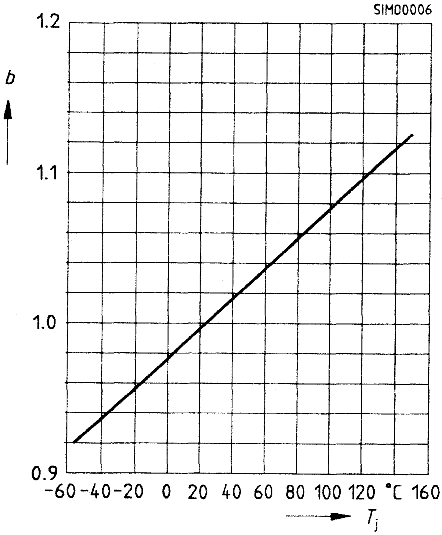
Gate threshold voltage
$V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = V_{GS}$, I_D = 1 mA



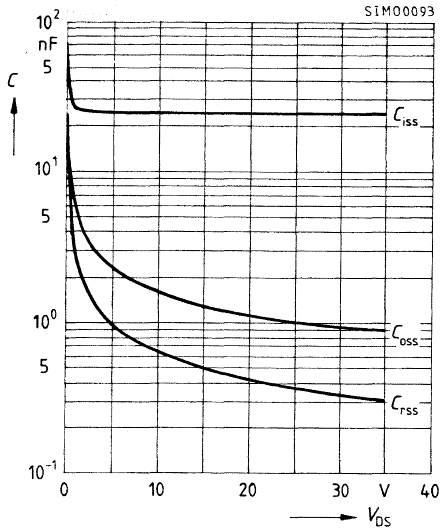
Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, T_j = 150 °C



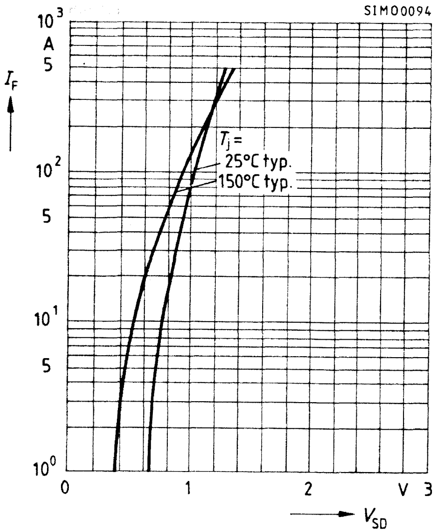
Drain-source breakdown voltage
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}(25\ °C)$



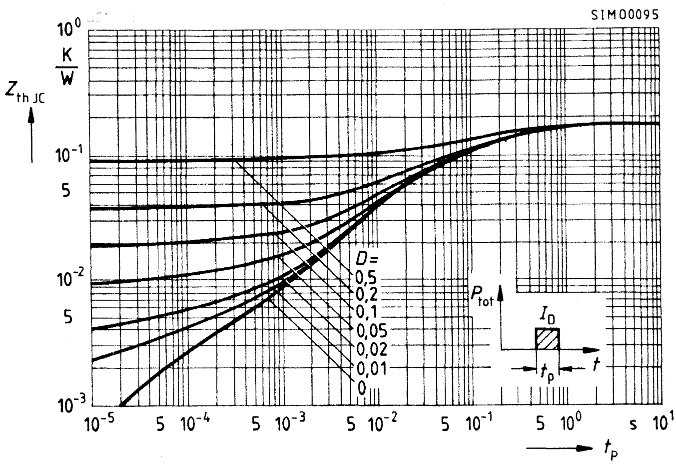
Typ. capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0, f = 1$ MHz (spread)



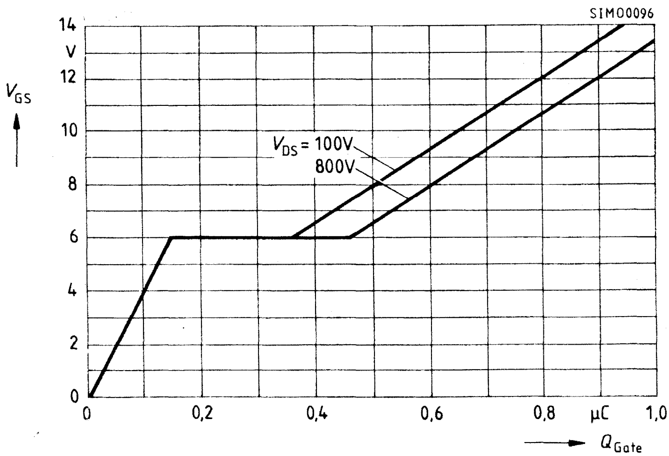
Forward characteristics of reverse diode $I_F = f(V_{SD})$
parameter: T_j, $t_p = 80\ \mu s$ (spread)



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 42 A



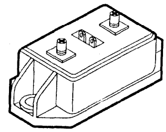
SIEMENS

SIMOPAC® Module

BSM 191 F

V_{DS} = 1000 V
I_D = 28 A
$R_{DS(on)}$ = 0.42 Ω

- Power module
- Single switch
- FREDFET
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 1[1]



Type	Ordering Code
BSM 191 F	C67076-A1053-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	1000	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	1000	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	28	A
Pulsed drain current, T_C = 25 °C	$I_{D\,puls}$	110	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	700	W
Thermal resistance Chip-case	$R_{th\,JC}$	≤ 0.18	K/W
Insulation test voltage[2], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	1000	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 1000 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 18 A	$R_{DS(on)}$	–	0.38	0.42	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 18 A	g_{fs}	15	22	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	22	30	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	1.0	1.5	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.36	0.5	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 500 V, V_{GS} = 10 V I_D = 18 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	60	–	ns
	t_r	–	30	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 500 V, V_{GS} = 10 V I_D = 18 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	350	–	
	t_f	–	60	–	

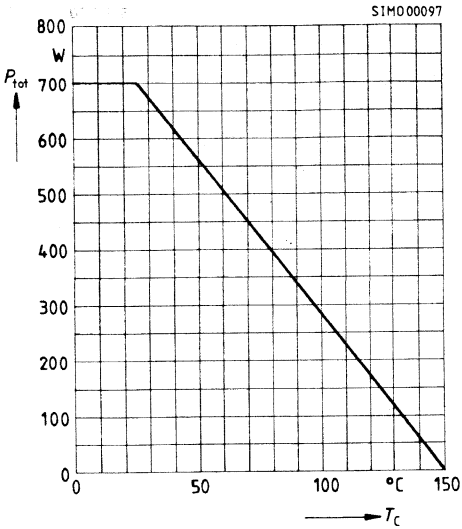
Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Fast recovery reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	28	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	110	
Diode forward on-voltage[1)] I_F = 56 A , V_{GS} = 0	V_{SD}	–	1.2	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	t_{rr}	–	300	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	Q_{rr}	–	2.2	–	µC

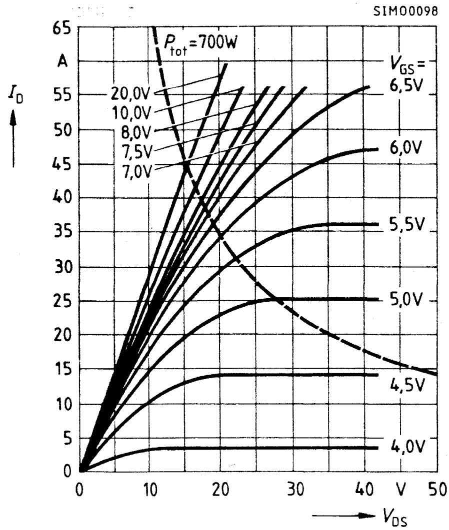
1) upon request

Characteristics at T_j = 25 ˚C, unless otherwise specified.

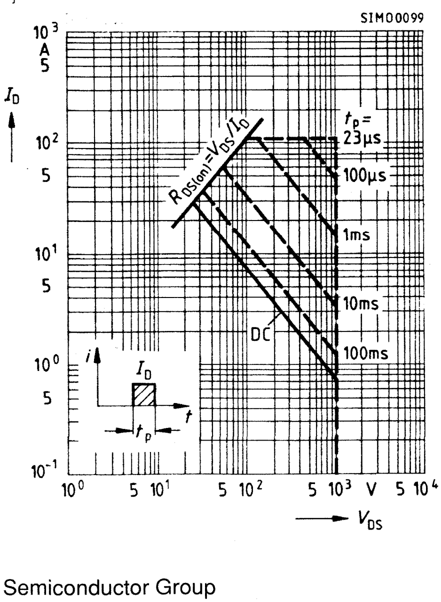
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 ˚C



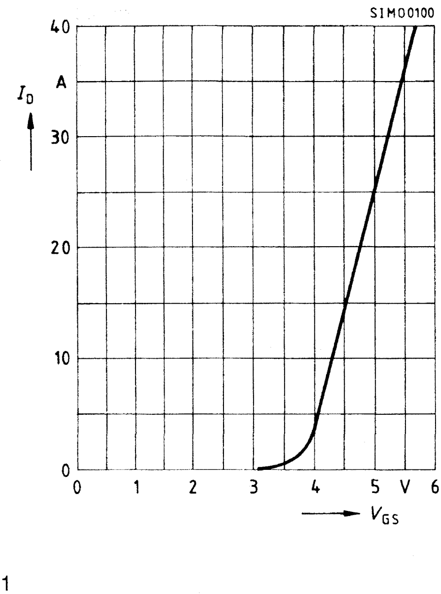
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



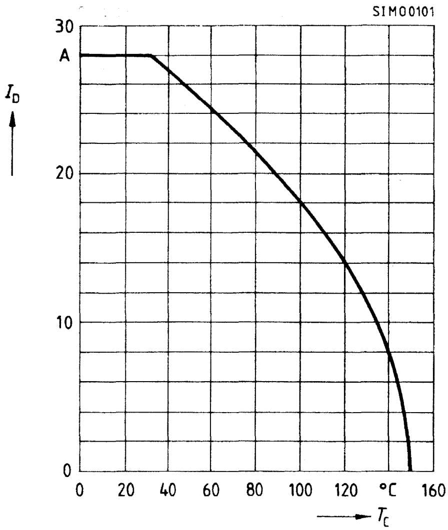
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 ˚C,
$T_j \leq$ 150 ˚C



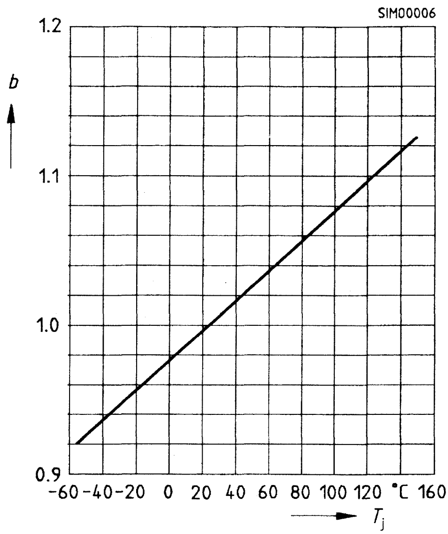
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



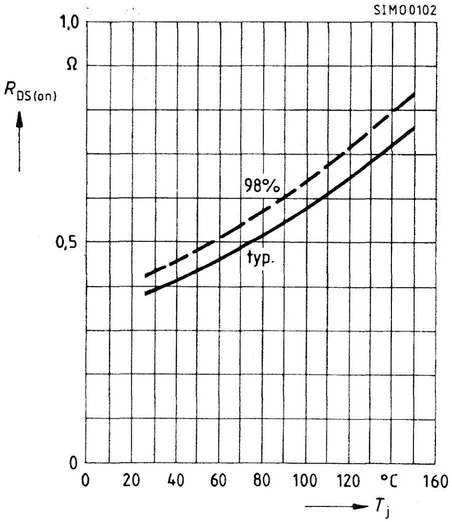
Continuous drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, $T_j = 150$ °C



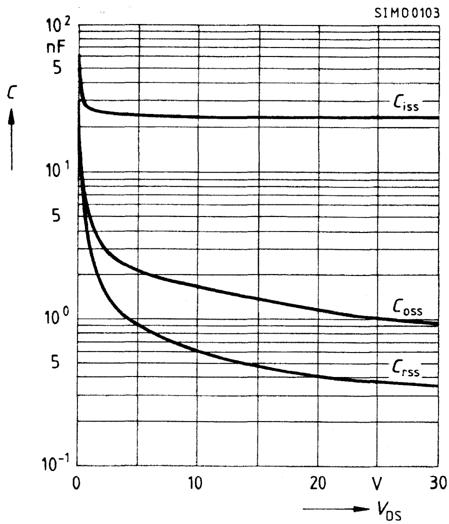
Drain-source breakdown voltage
$V_{(BR)DSS}$ **(T_j) = b x $V_{(BR)DSS}$ (25 °C)**



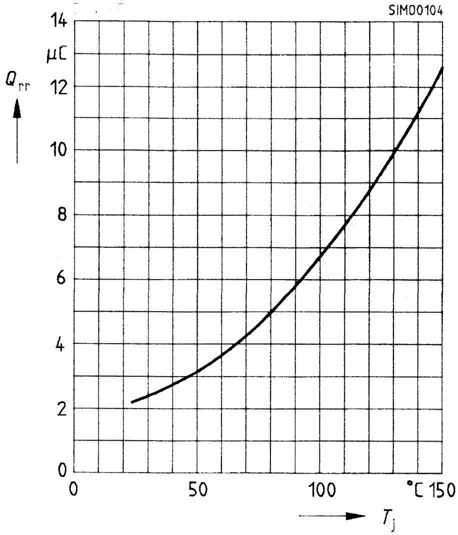
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: $I_D = 18$ A; $V_{GS} = 10$ V (spread)



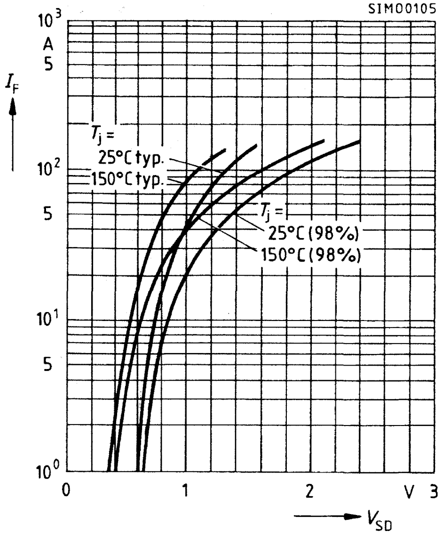
Typ. capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz



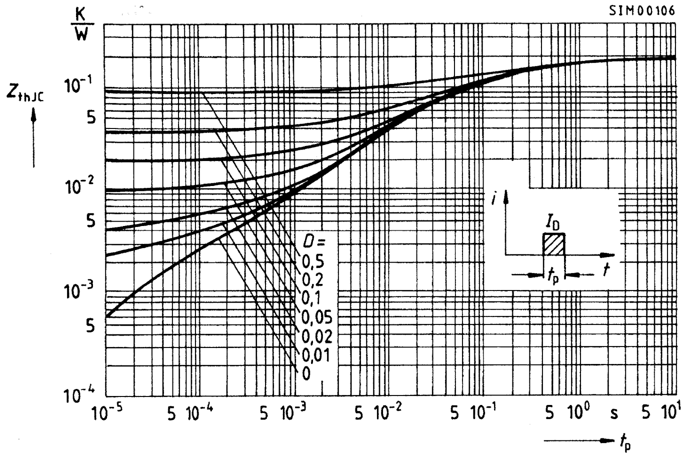
Typ. reverse recovery charge $Q_{rr} = f(T_j)$
parameter: di_F/dt = 100 A/ µs,
I_F = 28 A, V_R = 100 V



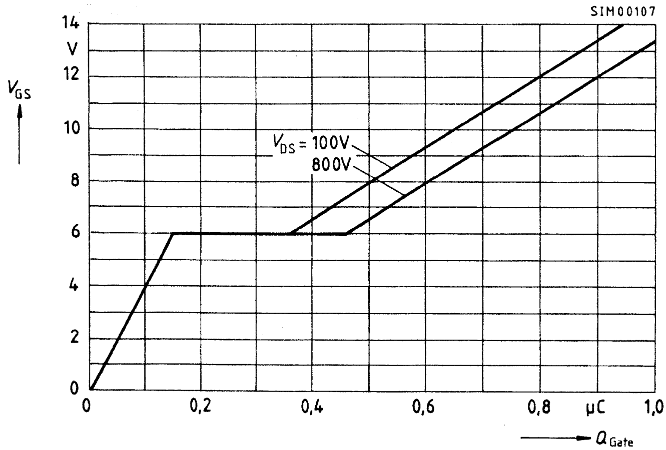
Forward characteristics of fast-recovery reverse diode $I_F = f(V_{SD})$
parameter: T_j,t_p = 80 µs (spread)



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 42 A



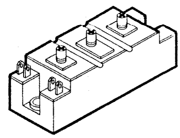
SIEMENS

SIMOPAC® Module

BSM 204 A

V_{DS} = **50 V**
I_D = **2 × 200 A**
$R_{DS(on)}$ = **4.5 mΩ**

- Power module
- Half-bridge
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 2a[1)]



VM205170

Type	Ordering Code
BSM 204 A	C67076-S1102-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	50	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	50	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 55 °C	I_D	200	A
Pulsed drain current, T_C = 55 °C	$I_{D\,puls}$	600	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	400	W
Thermal resistance Chip-case	$R_{th\,JC}$	≤ 0.31	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

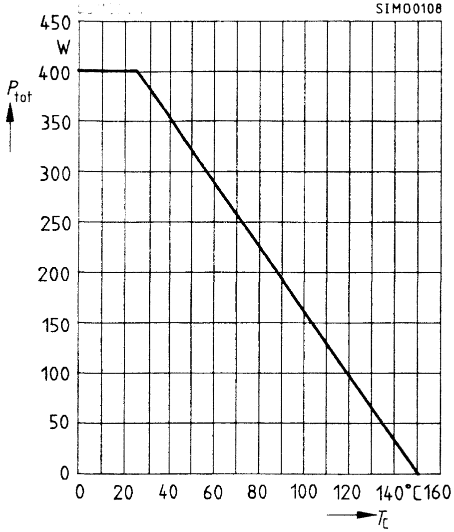
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	50	–	–	V
Gate threshold voltage $V_{GS} = V_{DS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 50 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 130 A	$R_{DS(on)}$	–	3.8	4.5	mΩ
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 130 A	g_{fs}	90	130	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	12	16	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	6	8	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	1.6	2.4	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 40 V, V_{GS} = 10 V I_D = 200 A, R_G = 3.3 Ω	$t_{d(on)}$	–	280	–	ns
	t_r	–	220	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 40 V, V_{GS} = 10 V I_D = 200 A, R_G = 3.3 Ω	$t_{d(off)}$	–	290	–	
	t_f	–	60	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

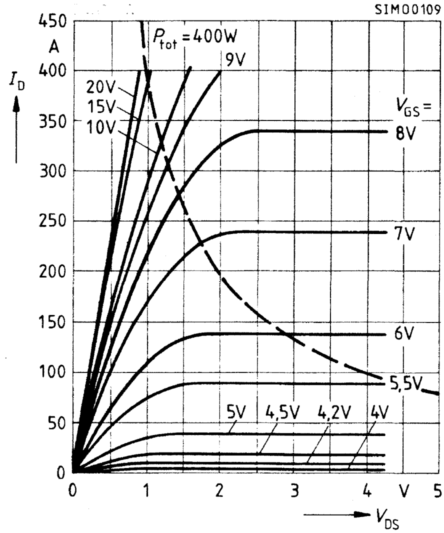
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	200	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	600	
Diode forward on-voltage I_F = 400 A , V_{GS} = 0	V_{SD}	–	1.25	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 30 V	t_{rr}	–	350	–	µs
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 30 V	Q_{rr}	–	4	–	µC

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

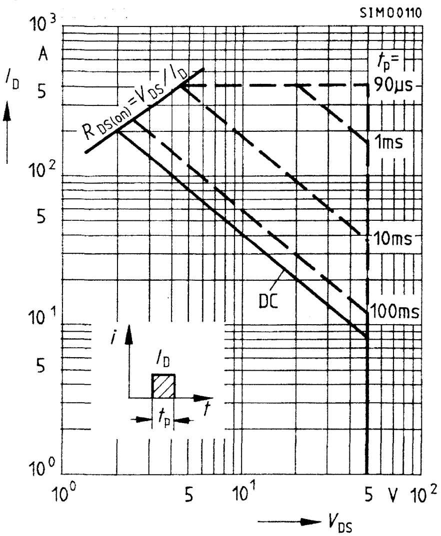
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



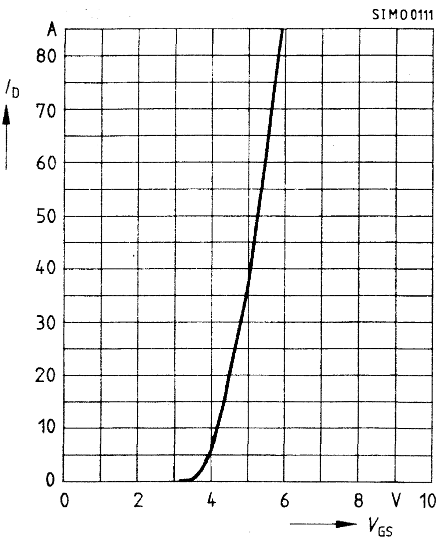
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



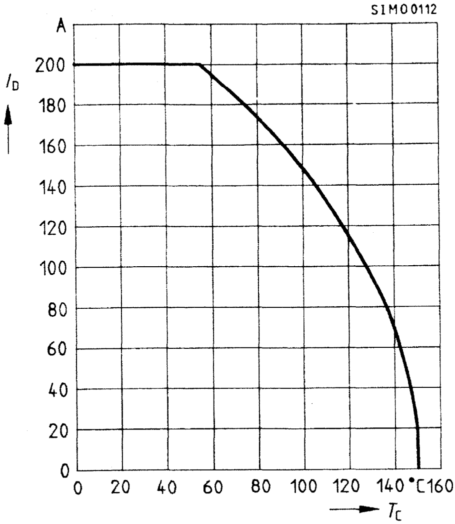
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



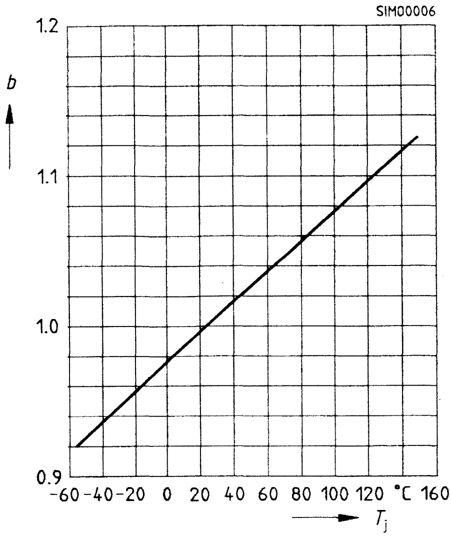
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



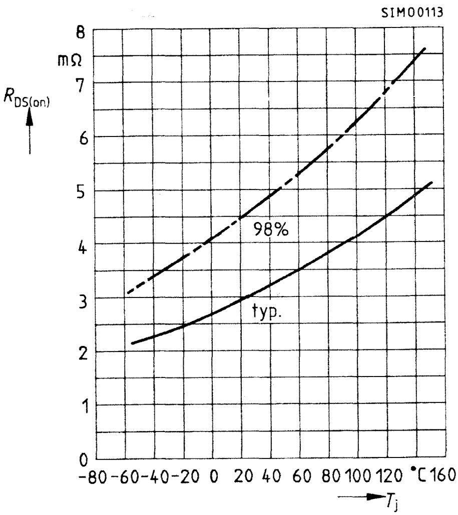
Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, T_j = 150 °C



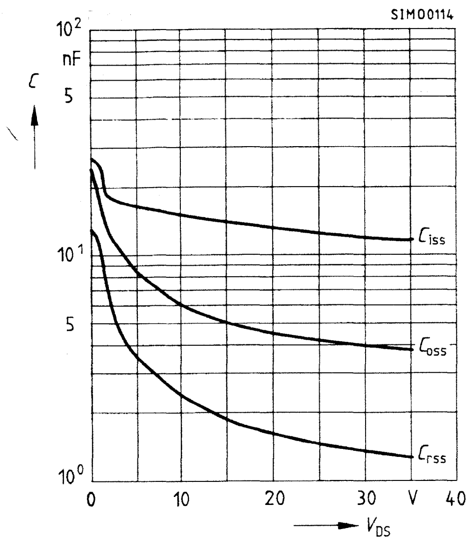
Drain-source breakdown voltage
$V_{(BR)DSS} = b \times V_{(BR)DSS}$ **(25 °C)**



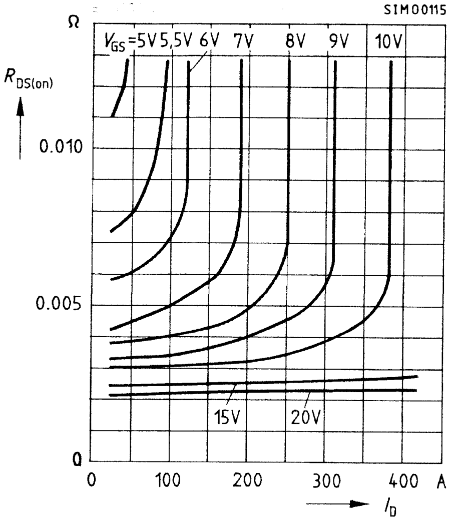
Drain-source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: I_D = 130 A; V_{GS} = 10 V



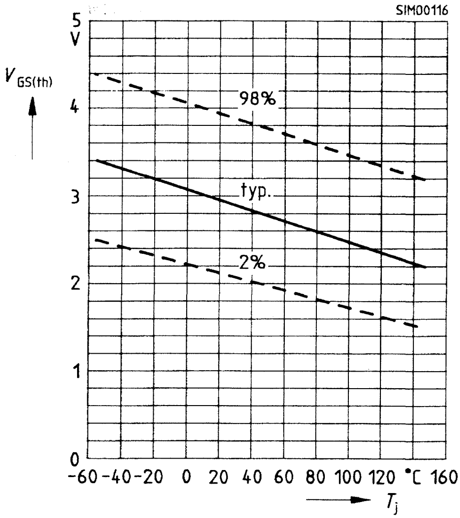
Typ. capacitances $C = f(V_{DS})$
parameter: V_{GS} = 0, f = 1 MHz



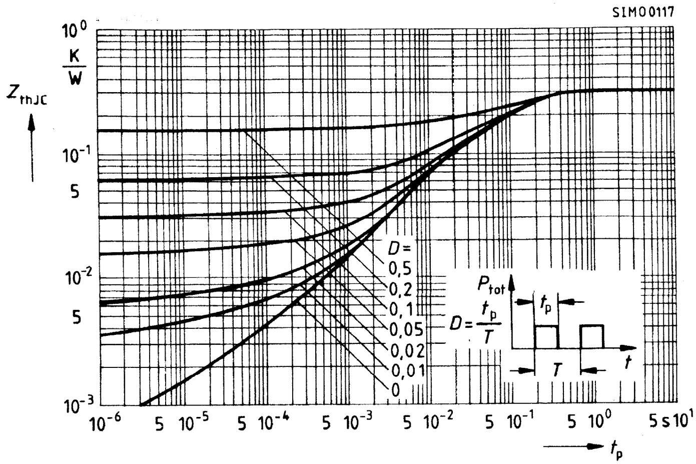
Drain source on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}



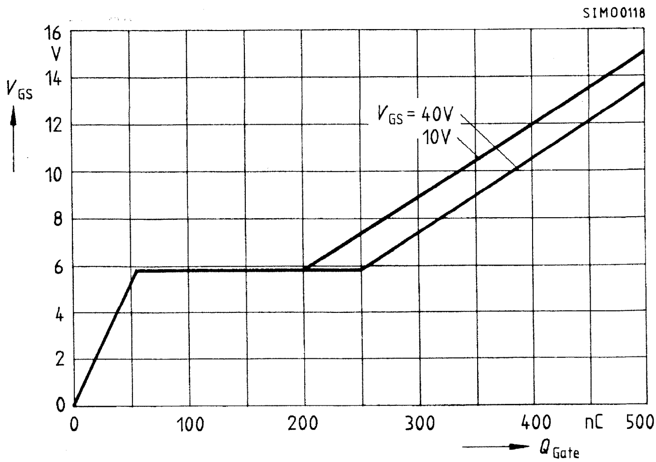
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, I_D = 1 mA (spread)



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 330 A

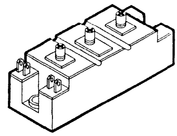


SIEMENS

SIMOPAC® Module **BSM 214 A**

V_{DS} = 100 V
I_D = 2 × 125 A
$R_{DS(on)}$ = 0.013 Ω

- Power module
- Half-bridge
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 2a[1]



Type	Ordering Code
BSM 214 A	C67076-S1100-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	100	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	100	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	125	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	375	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	400	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.31	K/W
Insulation test voltage[2], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

[1] See chapter Package Outline and Circuit Diagrams.
[2] Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

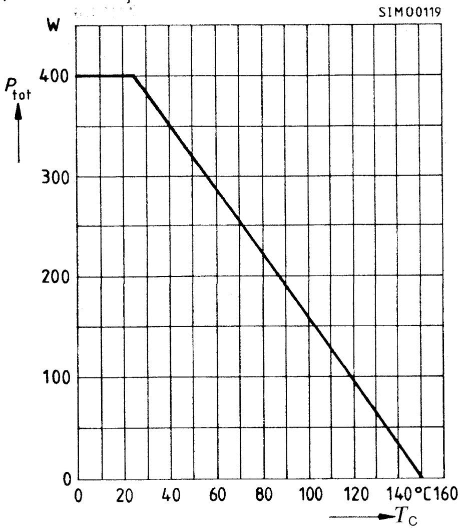
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	100	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 50 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 38 A	$R_{DS(on)}$	–	0.01	0.013	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 38 A	g_{fs}	40	60	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	9	12	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	4	6	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	1.6	2.4	
Turn-on time t_{on} ($t_{on} = t_{d\,(on)} + t_r$) V_{CC} = 50 V, V_{GS} = 10 V I_D = 78 A, R_{GS} = 3.3 Ω	$t_{d\,(on)}$	–	50	–	ns
	t_r	–	190	–	
Turn-off time t_{off} ($t_{off} = t_{d\,(off)} + t_f$) V_{CC} = 50 V, V_{GS} = 10 V I_D = 78 A, R_{GS} = 3.3 Ω	$t_{d\,(off)}$	–	190	–	
	t_f	–	50	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

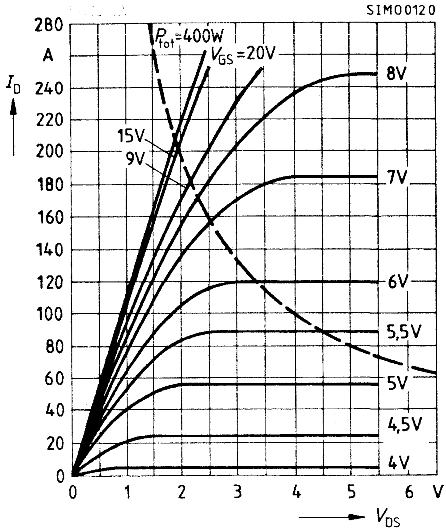
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	125	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	375	
Diode forward on-voltage I_F = 250 A , V_{GS} = 0	V_{SD}	–	1.25	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 30 V	t_{rr}	–	320	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 30 V	Q_{rr}	–	3.6	–	µC

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

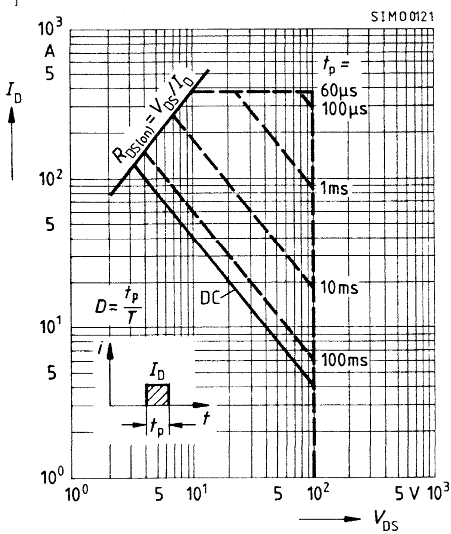
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



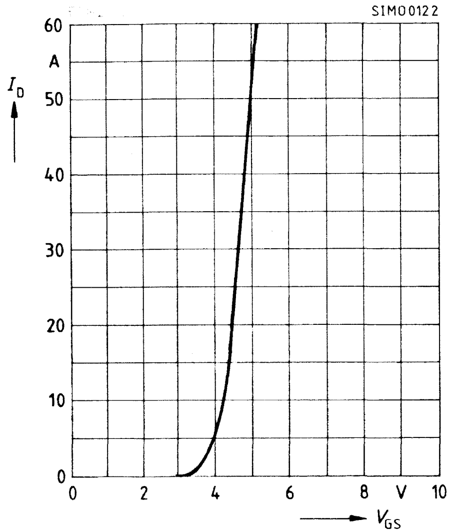
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



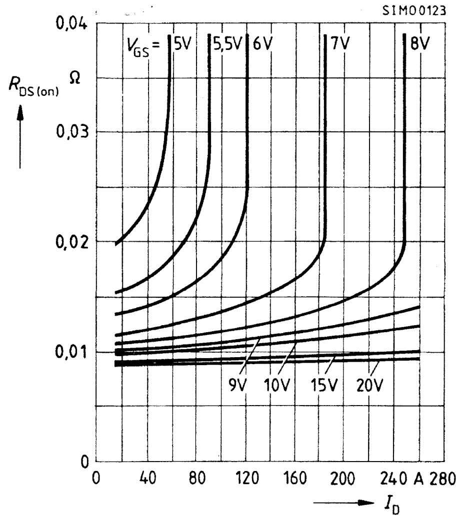
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



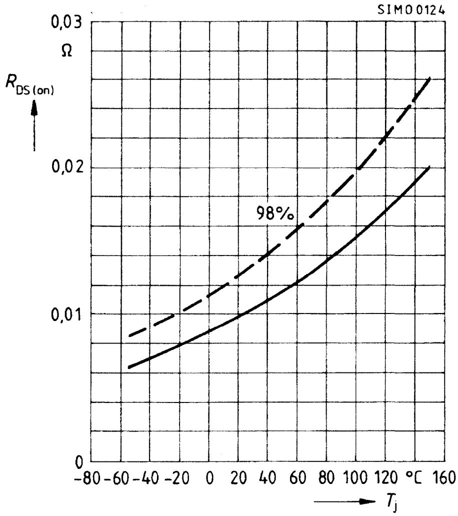
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



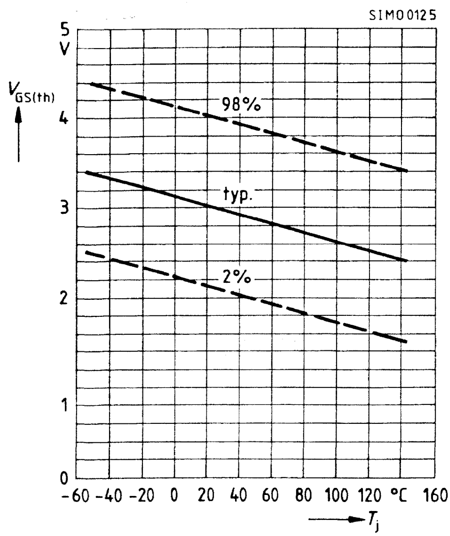
Typ. on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}



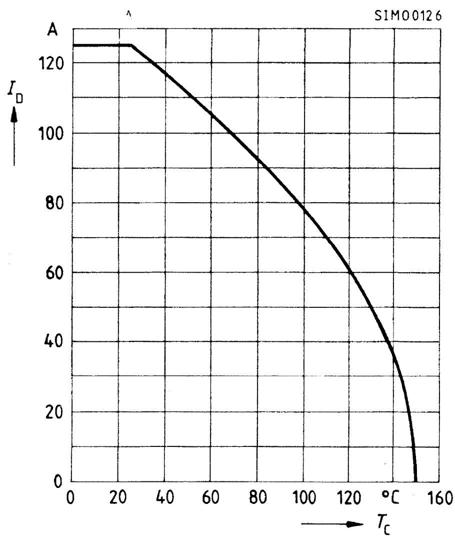
On-state resistance $R_{DS(on)} = f(T_j)$
parameter: I_D = 38 A; V_{GS} = 10 V (spread)



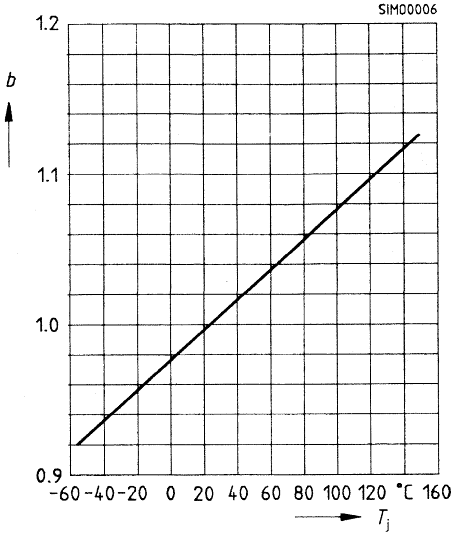
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = V_{GS}$, I_D = 1 mA (spread)



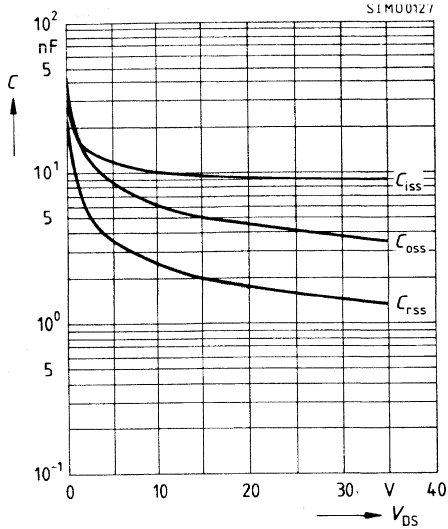
Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, T_j = 150 °C



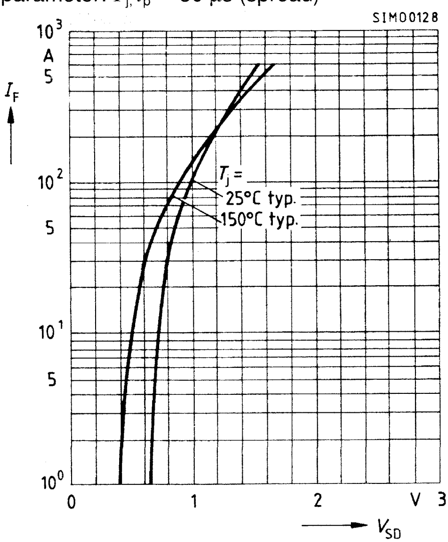
Drain source breakdown voltage
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}$ **(25 °C)**



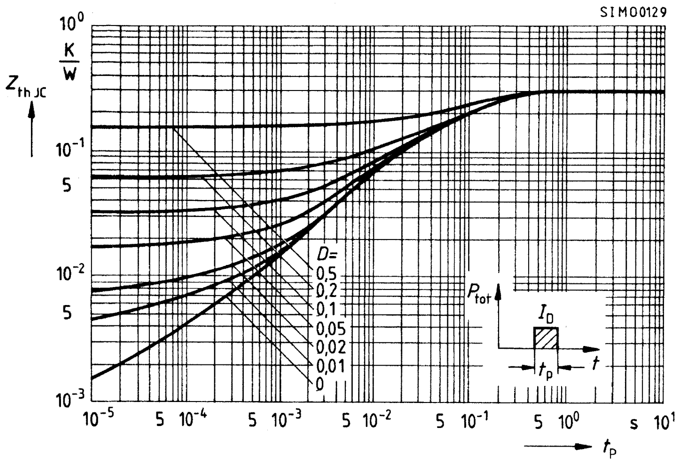
Typ. capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0, f = 1$ MHz (spread)



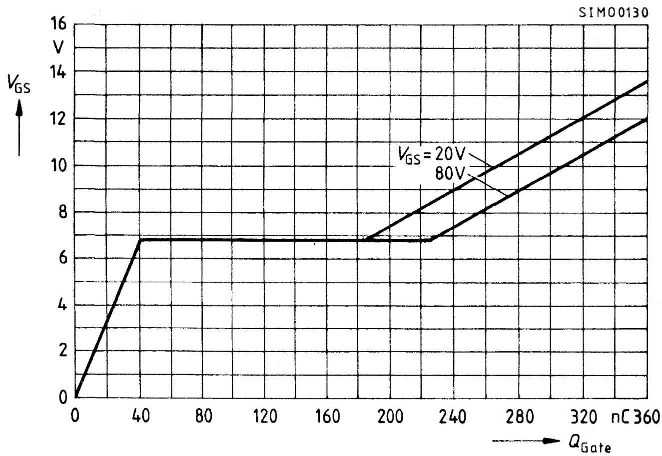
Forward characteristics of reverse diode $I_F = f(V_{SD})$
parameter: T_j, t_p = 80 µs (spread)



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 185 A



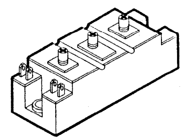
SIEMENS

SIMOPAC® Module

BSM 224 A

V_{DS} = 200 V
I_D = 2 × 81 A
$R_{DS(on)}$ = 0.03 Ω

- Power module
- Half-bridge
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 2a[1)]



Type	Ordering Code
BSM 224 A	C67076-S1101-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	200	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	200	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	81	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	250	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	400	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.31	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

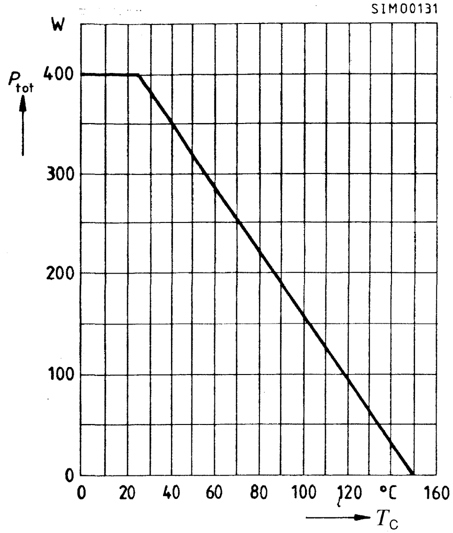
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	200	–	–	V
Gate threshold voltage $V_{GS} = V_{DS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 200 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 50 A	$R_{DS(on)}$	–	0.023	0.03	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 50 A	g_{fs}	40	58	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	7	9	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	2.5	4	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.8	1.5	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 100 V, V_{GS} = 10 V I_D = 52 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	55	–	ns
	t_r	–	110	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 100 V, V_{GS} = 10 V I_D = 52 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	220	–	
	t_f	–	35	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

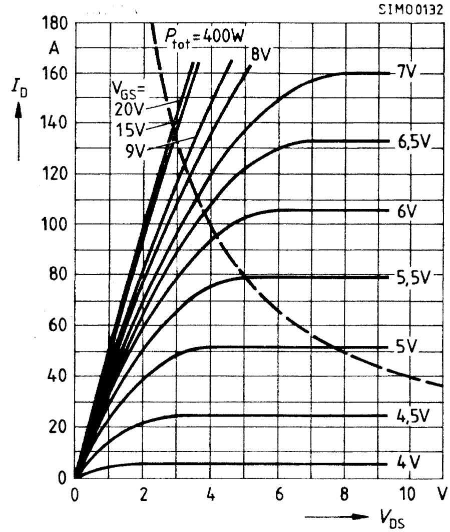
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	81	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	250	
Diode forward on-voltage I_F = 162 A , V_{GS} = 0	V_{SD}	–	1.25	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	t_{rr}	–	320	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	Q_{rr}	–	4.3	–	µC

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

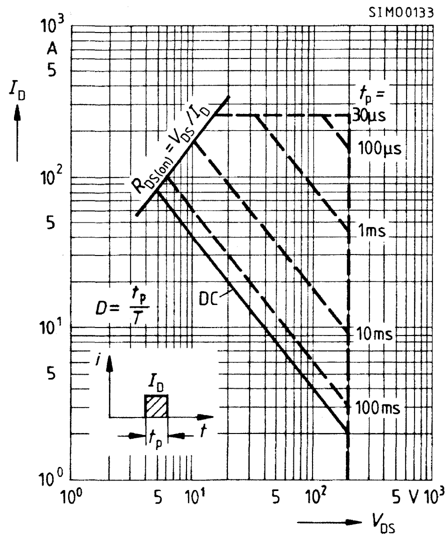
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



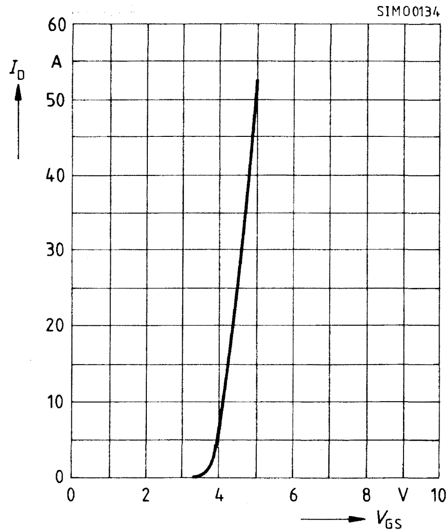
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



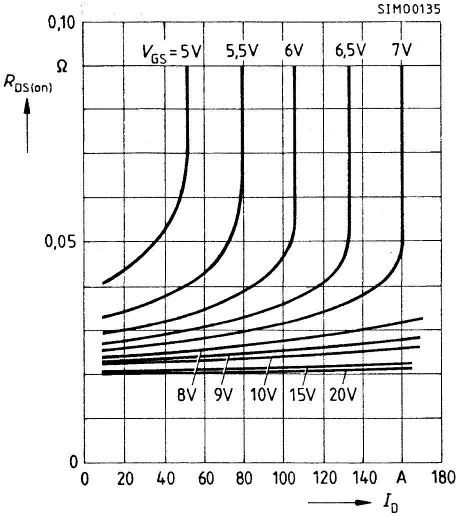
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \le$ 150 °C



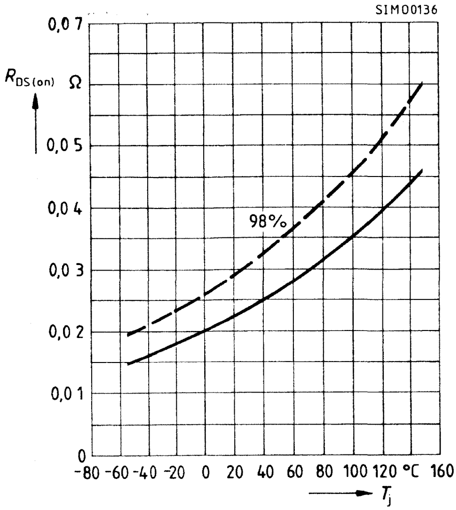
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



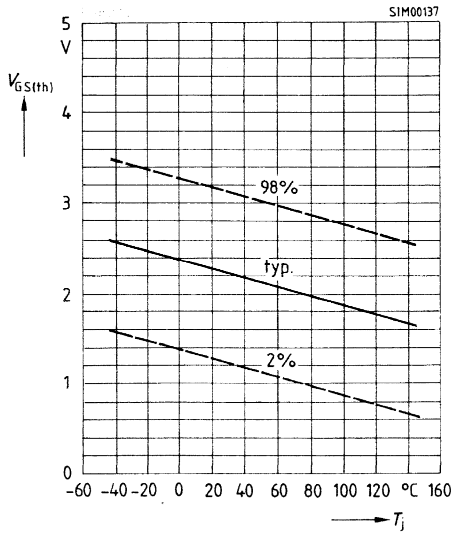
Typ. on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}



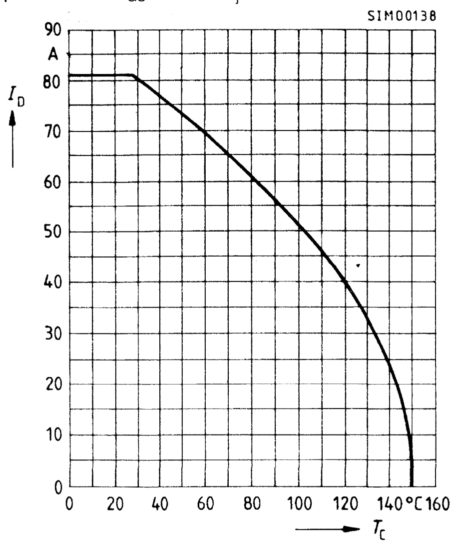
On-state resistance $R_{DS(on)} = f(T_j)$
parameter: I_D = 50 A; V_{GS} = 10 V (spread)



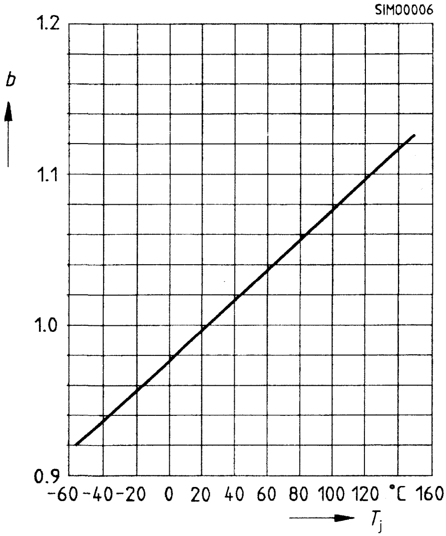
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = V_{GS}$, I_D = 1 mA (spread)



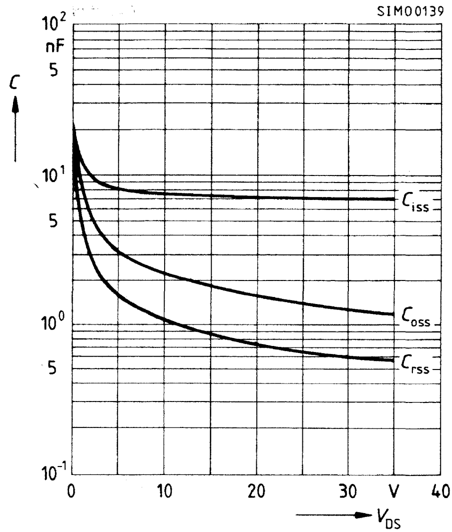
Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq$ 10 V, T_j = 150 °C



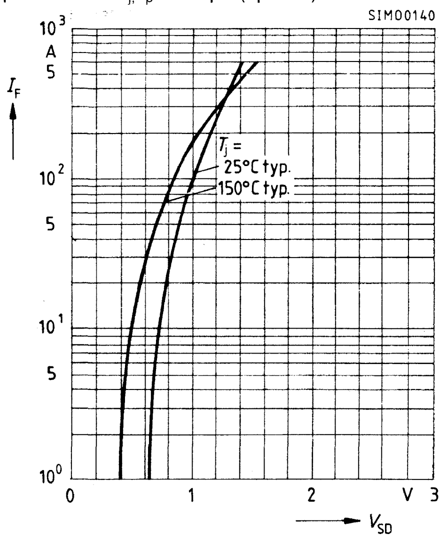
Drain source breakdown voltage
$V_{(BR)DSS}\ (T_j) = b \times V_{(BR)DSS}$ **(25 °C)**



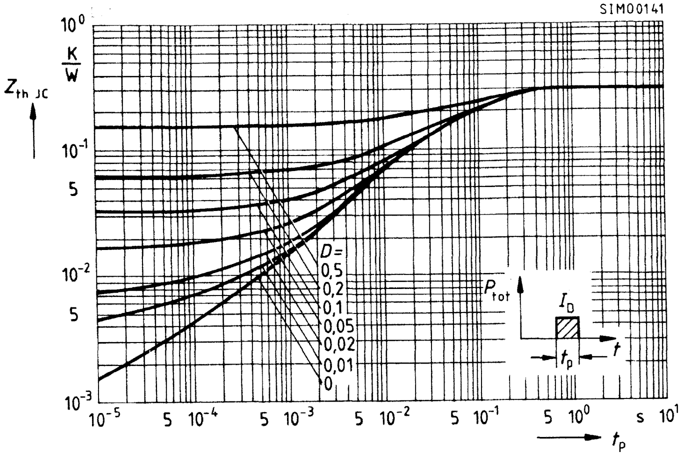
Typ. capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0, f = 1$ MHz (spread)



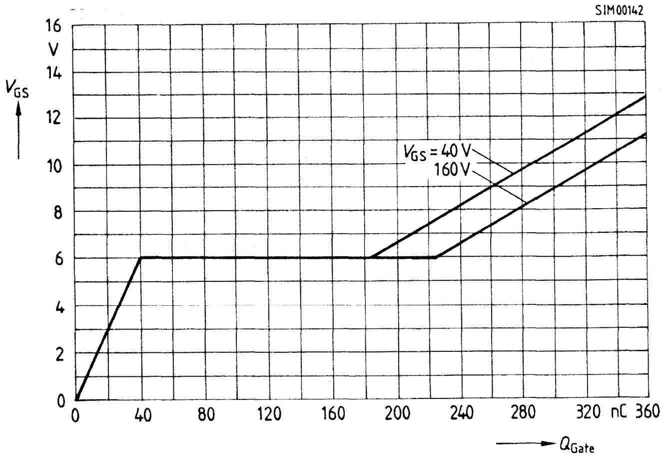
Forward characteristics
of reverse diode $I_F = f(V_{SD})$
parameter: T_j, t_p = 80 µs (spread)



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 121 A

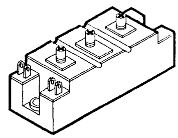


SIEMENS

SIMOPAC® Module — BSM 244 F

V_{DS} = 400 V
I_D = 2 × 45 A
$R_{DS(on)}$ = 0.1 Ω

- Power module
- Half-bridge
- FREDFET
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 2a[1]



VM205170

Type	Ordering Code
BSM 244 F	C67076-A1155-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	400	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	400	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	45	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	180	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	400	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.31	K/W
Insulation test voltage[2], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

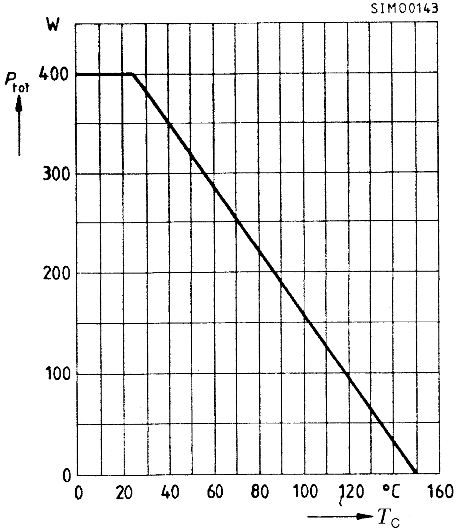
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	400	–	–	V
Gate threshold voltage $V_{GS} = V_{DS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 400 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 28 A	$R_{DS(on)}$	–	0.09	0.1	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 28 A	g_{fs}	–	26	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	18	24	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	1.3	1.9	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.48	0.7	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 200 V, V_{GS} = 10 V I_D = 28 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	60	–	ns
	t_r	–	30	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 200 V, V_{GS} = 10 V I_D = 28 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	130	–	
	t_f	–	40	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

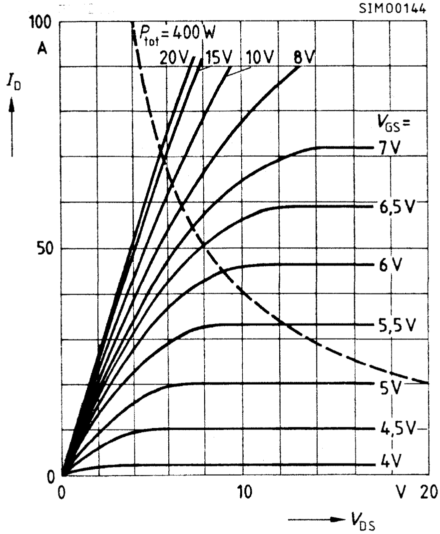
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Fast-recovery reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	45	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	180	
Diode forward on-voltage I_F = 90 A , V_{GS} = 0	V_{SD}	–	1.2	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	t_{rr}	–	200	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V	Q_{rr}	–	1.5	–	µC

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

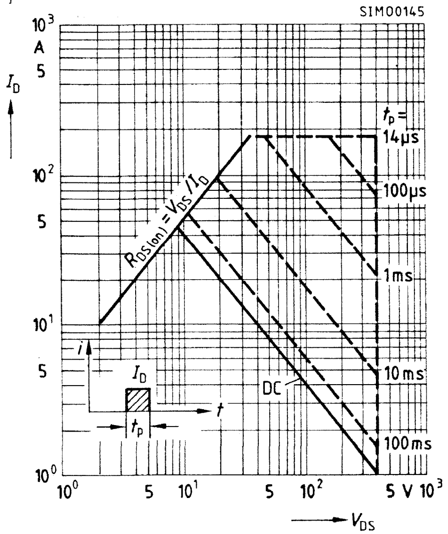
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



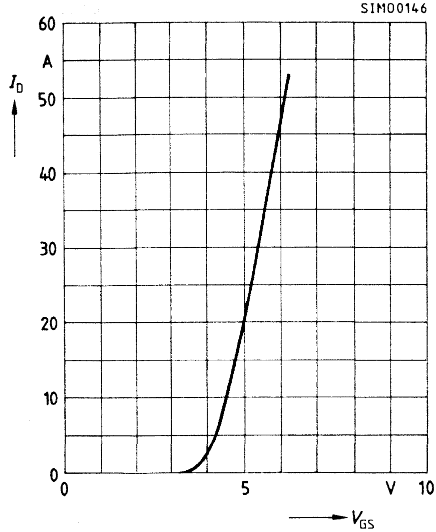
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



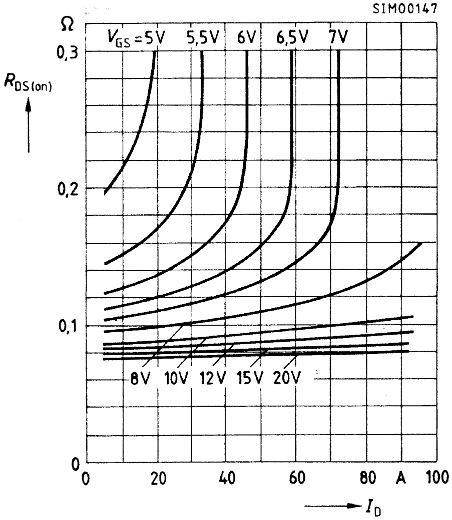
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



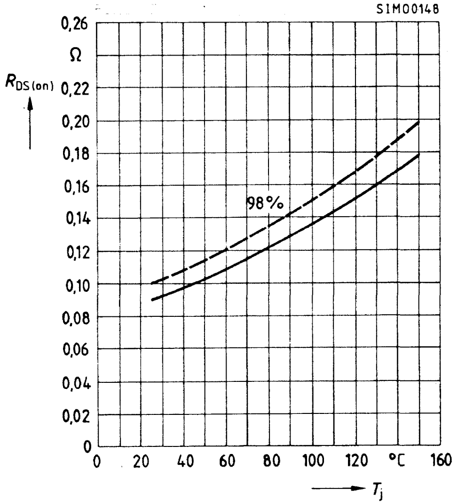
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



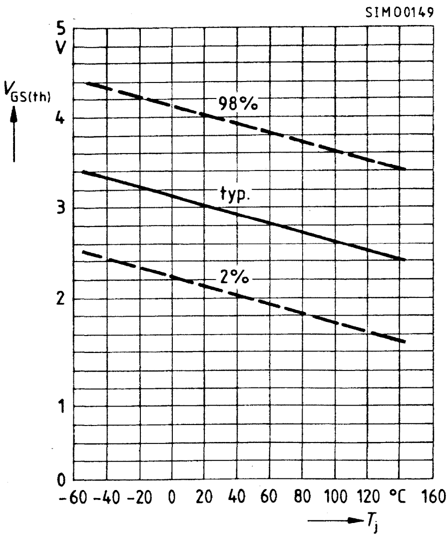
Typ. on-state resistance
$R_{DS(on)} = f(I_D)$
parameter: V_{GS}



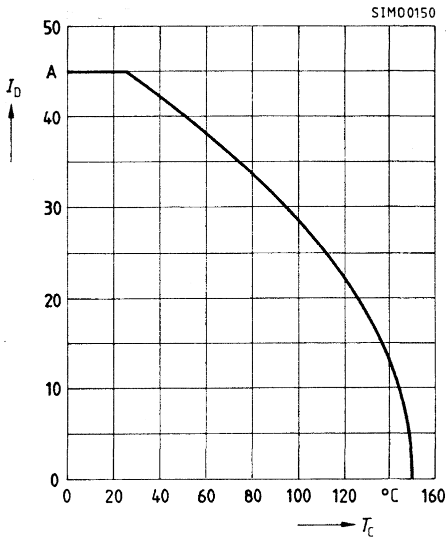
On-state resistance $R_{DS(on)} = f(T_j)$
parameter: I_D = 28 A; V_{GS} = 10 V (spread)



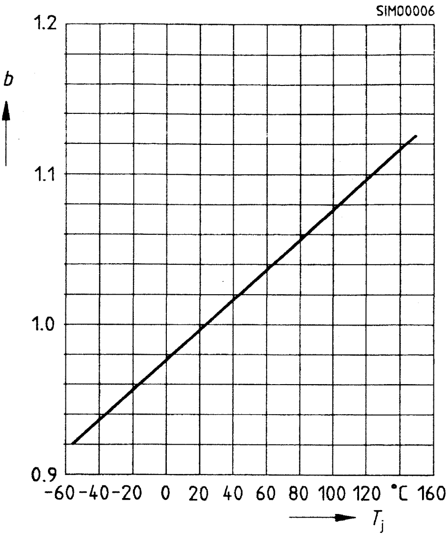
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{DS} = V_{GS}$, I_D = 1 mA (spread)



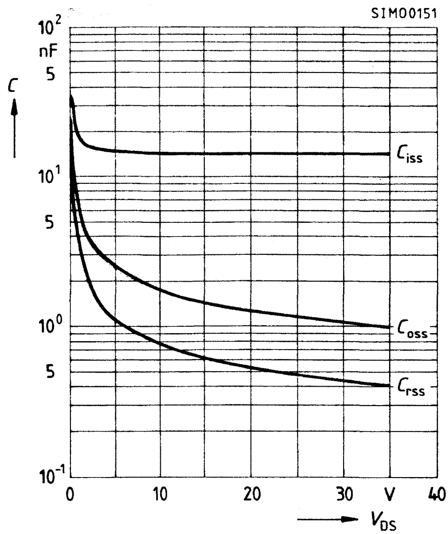
Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, T_j = 150 °C



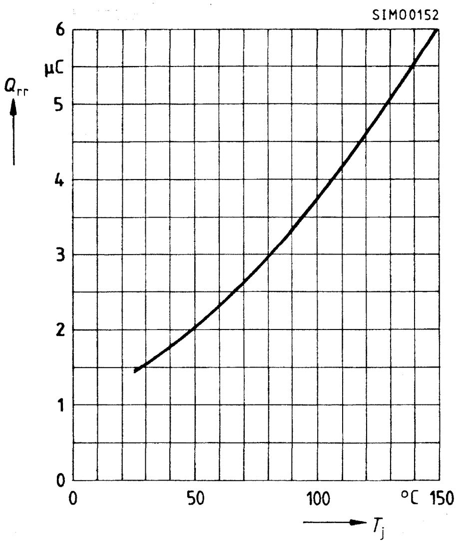
Drain-source breakdown voltage
$V_{(BR)DSS}\,(T_j) = b \times V_{(BR)DSS}$ **(25 °C)**



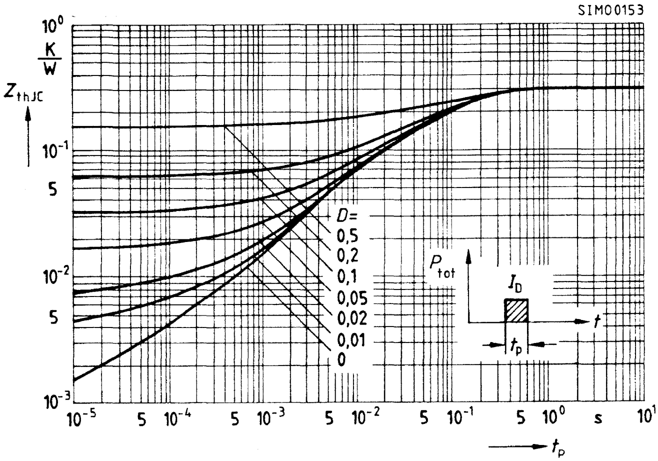
Typ. capacitances $C = f\,(V_{DS})$
parameter: $V_{GS} = 0, f = 1$ MHz (spread)



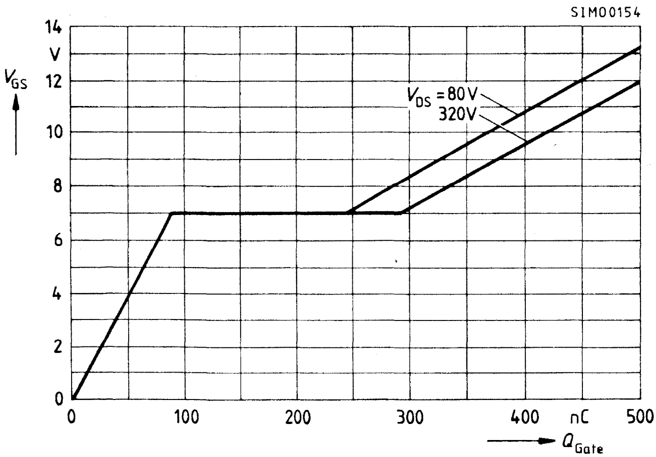
Typ. reverse recovery charge $Q_{rr} = f\,(T_j)$
parameter: di_F/dt = 100 A/µs, I_F = 45 A
V_R = 100 V



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 67.5 A

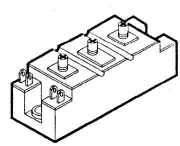


SIEMENS

SIMOPAC® Module BSM 254 F

V_{DS} = 500 V
I_D = 2 × 35 A
$R_{DS(on)}$ = 0.17 Ω

- Power module
- Half-bridge
- FREDFET
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 2a[1)]



Type	Ordering Code
BSM 254 F	C67076-A1150-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	500	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	500	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	35	A
Pulsed drain current, T_C = 25 °C	$I_{D\,puls}$	140	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	400	W
Thermal resistance Chip-case	$R_{th\,JC}$	≤ 0.31	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

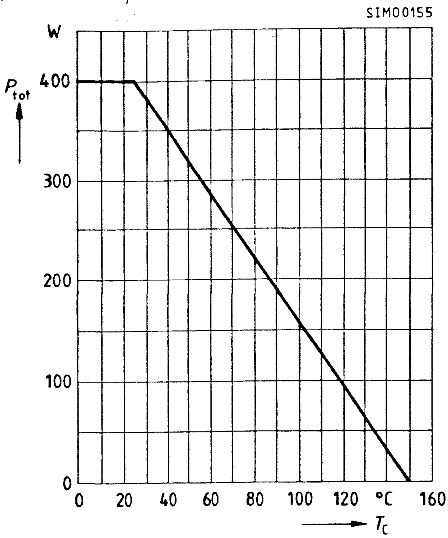
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	500	–	–	V
Gate threshold voltage $V_{GS} = V_{DS}$, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 500 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 22 A	$R_{DS(on)}$	–	0.14	0.17	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 22 A	g_{fs}	13	20	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	18	24	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	1.3	1.9	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.48	0.7	
Turn-on time t_{on} ($t_{on} = t_{d\,(on)} + t_r$) V_{CC} = 250 V, V_{GS} = 10 V I_D = 22 A, R_{GS} = 3.3 Ω	$t_{d\,(on)}$ t_r	– –	40 30	– –	ns
Turn-off time t_{off} ($t_{off} = t_{d\,(off)} + t_f$) V_{CC} = 250 V, V_{GS} = 10 V I_D = 22 A, R_{GS} = 3.3 Ω	$t_{d\,(off)}$ t_f	– –	70 55	– –	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

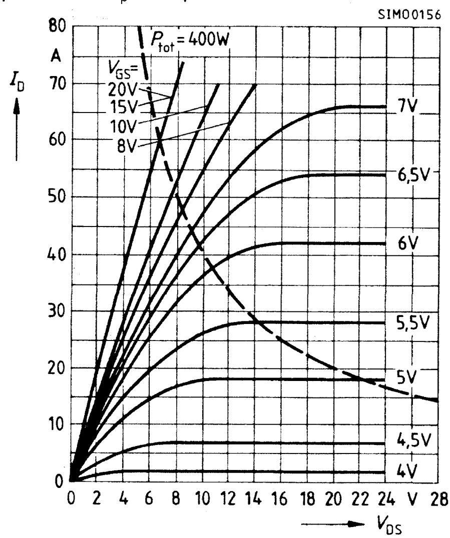
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Fast-recovery reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	– –	– –	35	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	140	
Diode forward on-voltage I_F = 70 A , V_{GS} = 0	V_{SD}	–	1.2	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	t_{rr}	– –	200 350	280 500	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	Q_{rr}	– –	1.5 8.5	2.5 12	µC
Repetitive peak reverse current $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	I_{RRM}	– –	12 28	– –	A

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

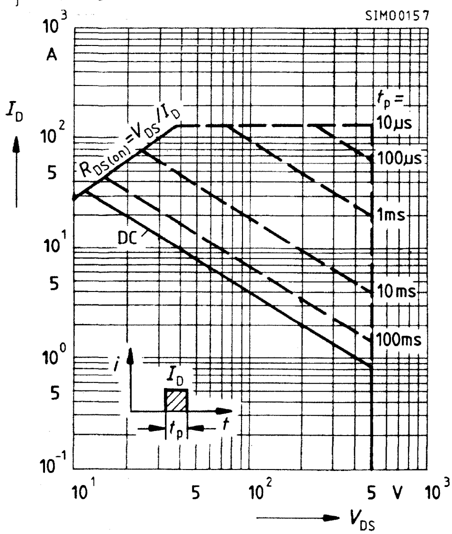
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



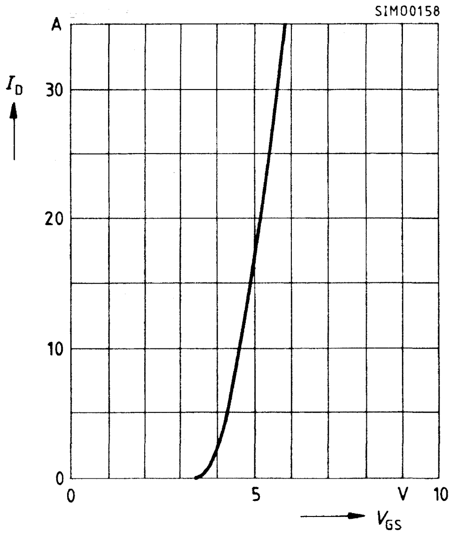
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



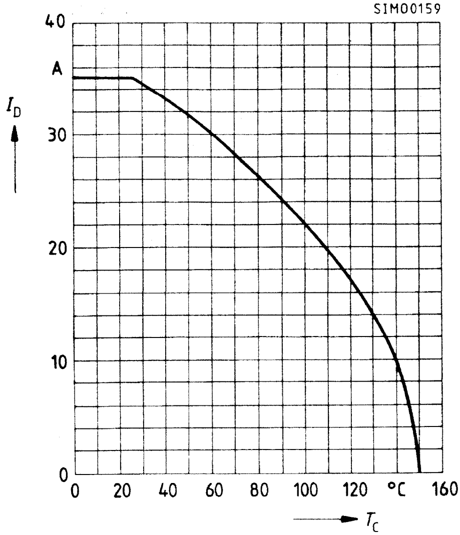
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



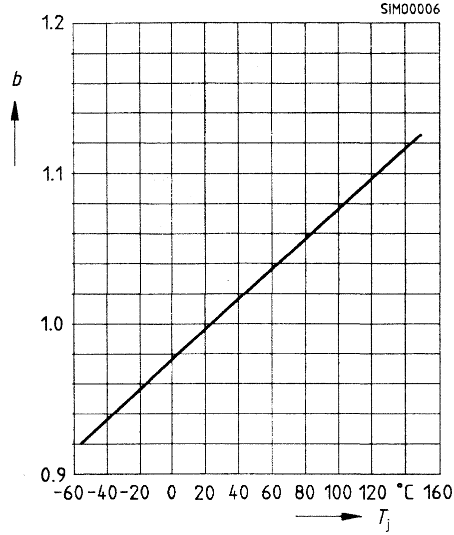
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



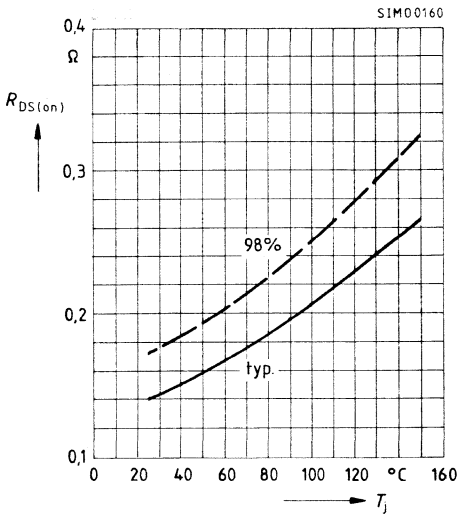
Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, T_j = 150 °C



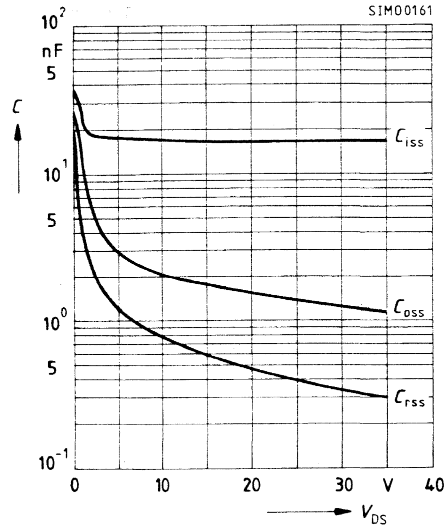
Drain-source breakdown voltage
$V_{(BR)DSS}$ (T_j) = $b \times V_{(BR)DSS}$ (25 °C)



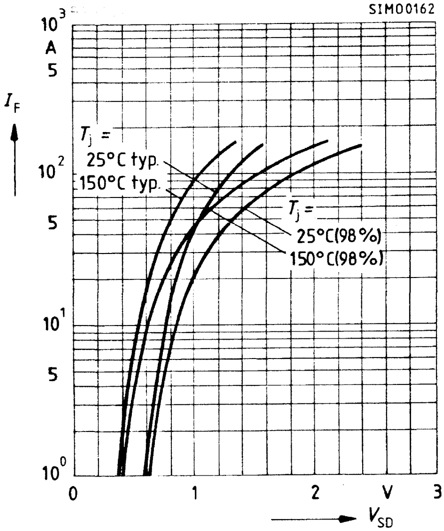
Drain source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: I_D = 22 A; V_{GS} = 10 V, (spread)



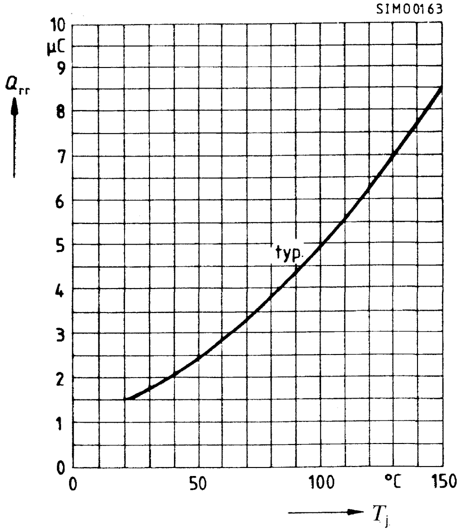
Typ. capacitances $C = f(V_{DS})$
parameter: V_{GS} = 0, f = 1 MHz (spread)



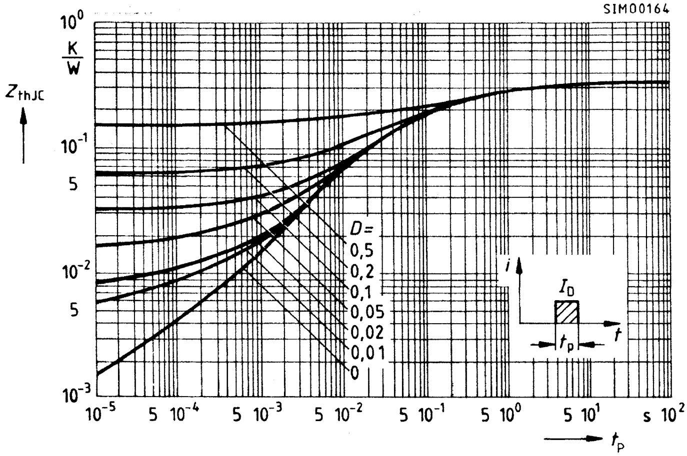
Forward characteristics of fast-recovery reverse diode $I_F = f(V_{SD})$
parameter: T_j, t_p = 80 µs (spread)



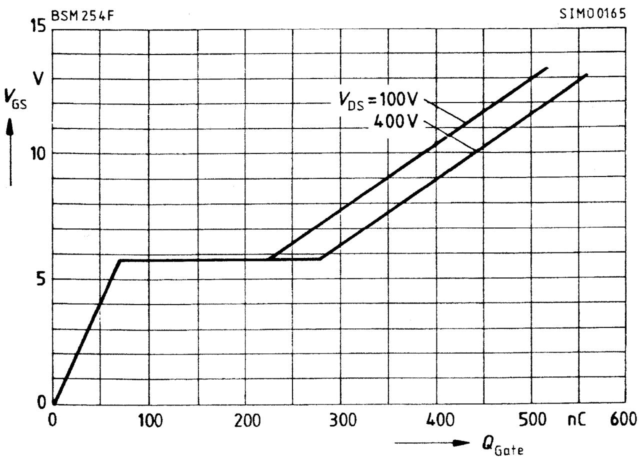
Typ. reverse recovery charge $Q_{rr} = f(T_j)$
parameter: di/dt = 100 A/µs, I_F = 35 A
V_R = 100 V



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 52.5 A

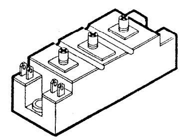


SIEMENS

SIMOPAC® Module — BSM 284 F

V_{DS} = **800 V**
I_D = **2 × 20 A**
$R_{DS(on)}$ = **0.48 Ω**

- Power module
- Half-bridge
- FREDFET
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 2a[1]



VM205170

Type	Ordering Code
BSM 284 F	C67076-A1152-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	800	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	800	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	20	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	80	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	400	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.31	K/W
Insulation test voltage[2], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

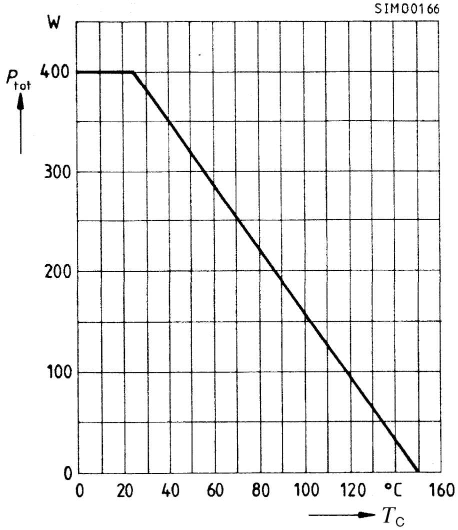
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	800	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 800 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 13 A	$R_{DS(on)}$	–	0.36	0.48	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 13 A	g_{fs}	10	18	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	15	20	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	0.7	1.5	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.3	1	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 400 V, V_{GS} = 10 V I_D = 13 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	50	–	ns
	t_r	–	30	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 400 V, V_{GS} = 10 V I_D = 13 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	130	–	
	t_f	–	35	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

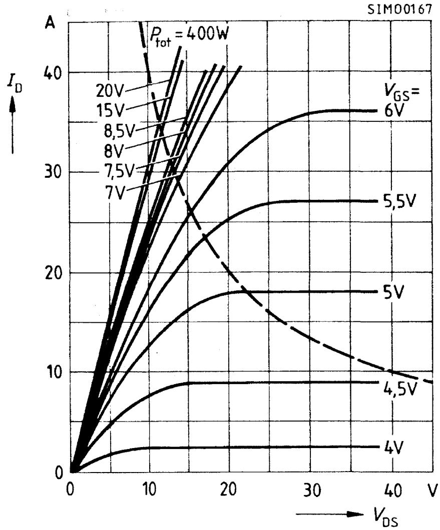
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Fast-recovery reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	20	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	80	
Diode forward on-voltage I_F = 40 A , V_{GS} = 0	V_{SD}	–	1.2	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 150 °C	t_{rr}	–	300	–	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	Q_{rr}	– –	2 6	– –	µC

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

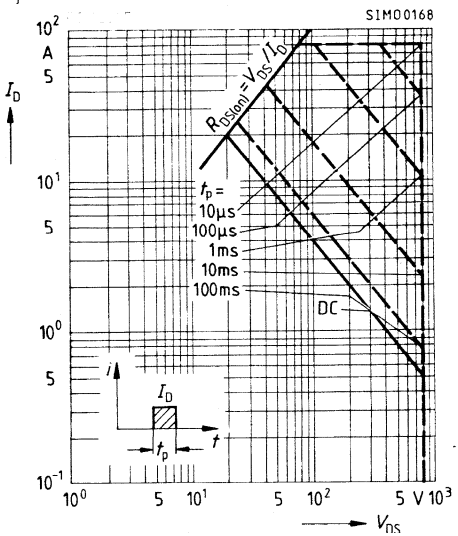
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



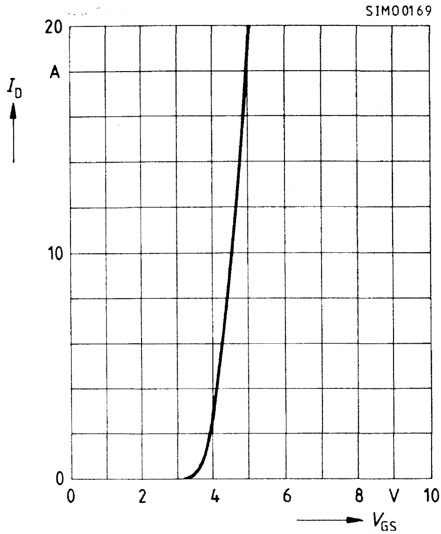
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



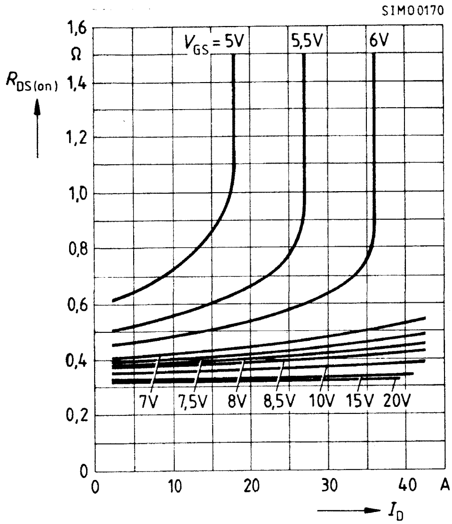
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C,
$T_j \leq$ 150 °C



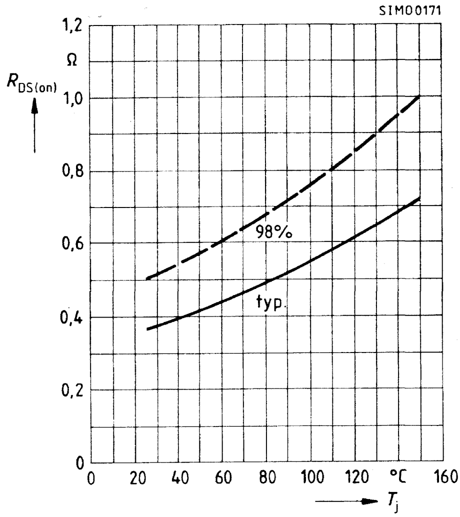
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



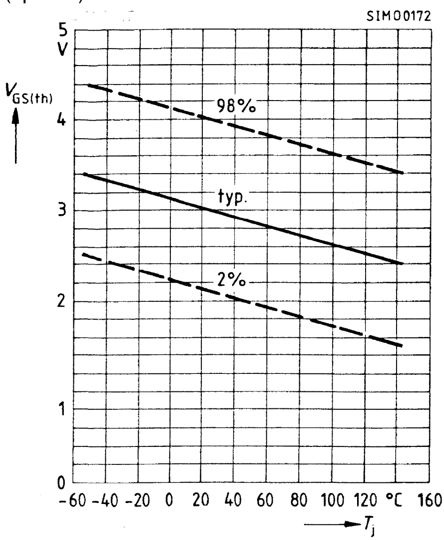
Typ. on-state resistance $R_{DS(on)} = f(I_D)$
parameter: V_{GS}



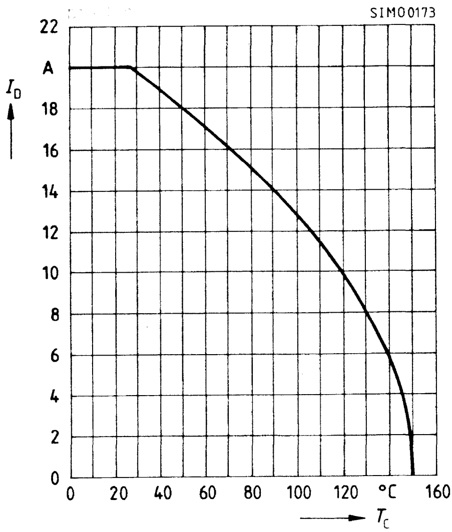
On state resistance $R_{DS(on)} = f(T_j)$
parameter: I_D = 13 A; V_{GS} = 10 V
(spread)



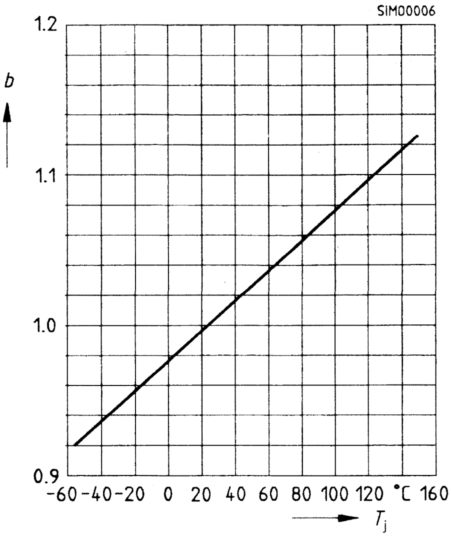
Gate threshold voltage $V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, I_D = 1 mA
(spread)



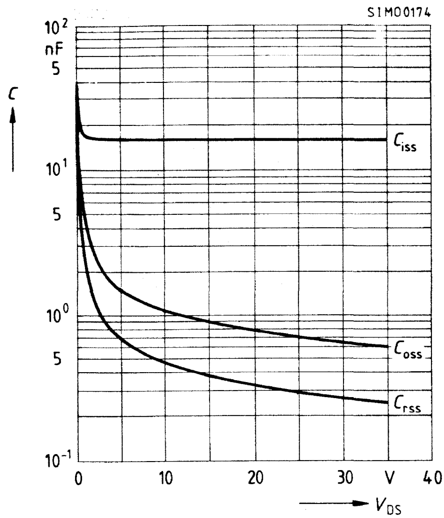
Drain current $I_D = f(T_C)$
parameter: V_{GS} = ≥ 10 V, T_j = 150 °C



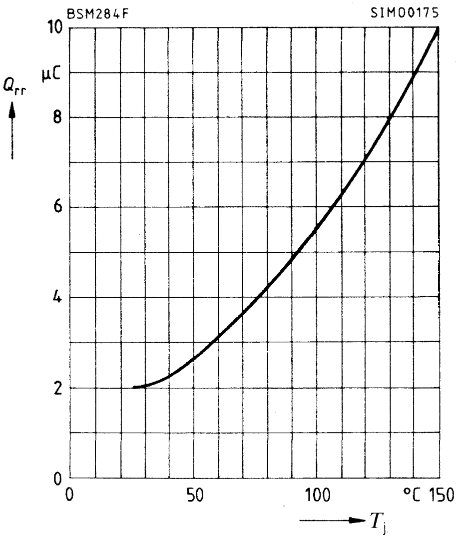
Drain-source breakdown voltage
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}$ **(25 °C)**



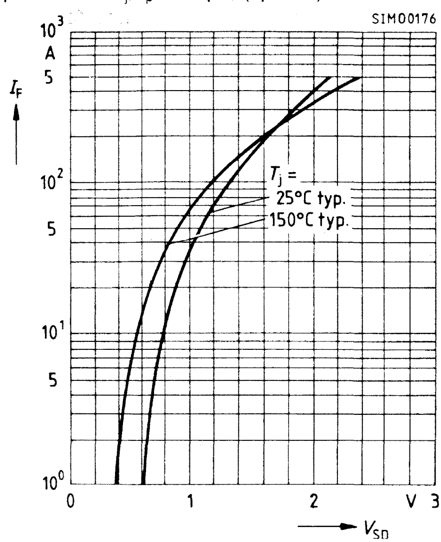
Typ. capacitances $C = f(V_{DS})$
parameter: $V_{GS} = 0$, $f = 1$ MHz



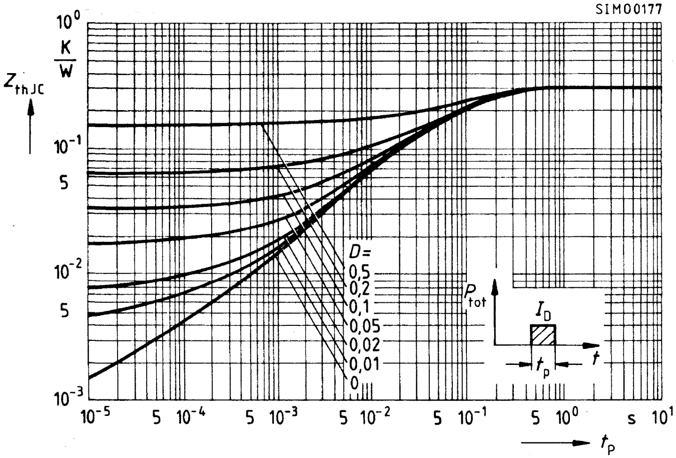
Typ. reverse recovery charge $Q_{rr} = f(T_j)$
parameter: $di_F/dt = 100$ A/µs, $I_F = 20$ A
$V_R = 100$ V



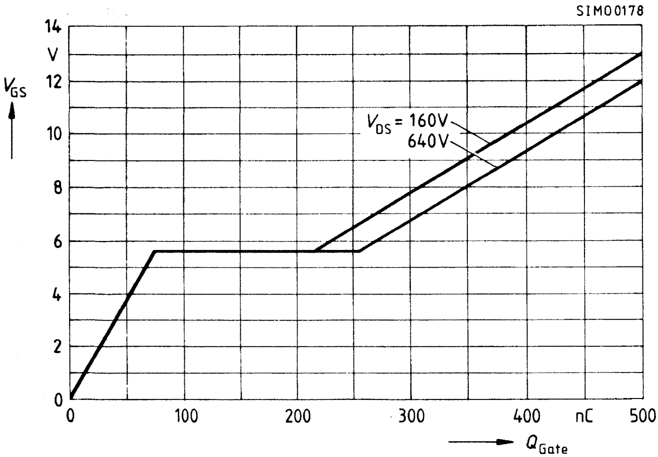
Forward characteristics of fast-recovery reverse diode $I_F = f(V_{SD})$
parameter: T_j, $t_p = 80$ µs, (spread)



Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 30 A



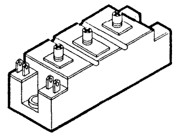
SIEMENS

SIMOPAC® Module

BSM 294 F

V_{DS} = **1000 V**
I_D = **2 × 18 A**
$R_{DS(on)}$ = **0.63 Ω**

- Power module
- Half-bridge
- FREDFET
- N channel
- Enhancement mode
- Package with insulated metal base plate
- Package outline/Circuit diagram: 2a[1]



Type	Ordering Code
BSM 294 F	C67076-A1151-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	1000	V
Drain-gate voltage, R_{GS} = 20 kΩ	V_{DGR}	1000	
Gate-source voltage	V_{GS}	± 20	
Continuous drain current, T_C = 25 °C	I_D	18	A
Pulsed drain current, T_C = 25 °C	$I_{D\ puls}$	72	
Operating and storage temperature range	T_j, T_{stg}	– 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	400	W
Thermal resistance Chip-case	$R_{th\ JC}$	≤ 0.31	K/W
Insulation test voltage[2], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance, drain-source	–	16	mm
Clearance, drain-source	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between drain and base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

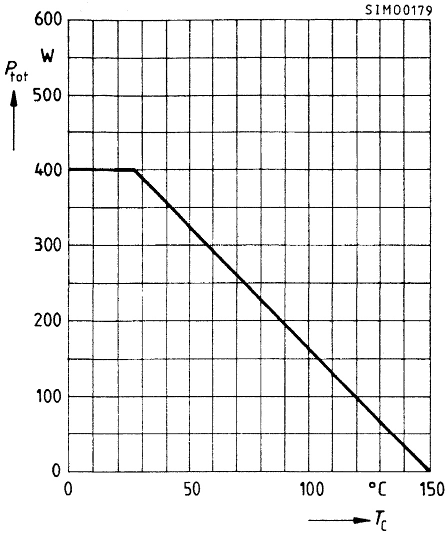
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage V_{GS} = 0, I_D = 0.25 mA	$V_{(BR)DSS}$	1000	–	–	V
Gate threshold voltage V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current V_{DS} = 1000 V, V_{GS} = 0 T_j = 25 °C T_j = 125 °C	I_{DSS}	 – –	 50 300	 250 1000	µA
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0	I_{GSS}	–	10	100	nA
Drain-source on-state resistance V_{GS} = 10 V, I_D = 11 A	$R_{DS(on)}$	–	0.57	0.63	Ω
Dynamic Characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max.}$, I_D = 11 A	g_{fs}	–	12	–	S
Input capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{iss}	–	18	24	nF
Output capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{oss}	–	0.9	1.5	
Reverse transfer capacitance V_{GS} = 0, V_{DS} = 25 V, f = 1 MHz	C_{rss}	–	0.35	0.6	
Turn-on time t_{on} ($t_{on} = t_{d(on)} + t_r$) V_{CC} = 500 V, V_{GS} = 10 V I_D = 11 A, R_{GS} = 3.3 Ω	$t_{d(on)}$	–	40	–	ns
	t_r	–	30	–	
Turn-off time t_{off} ($t_{off} = t_{d(off)} + t_f$) V_{CC} = 500 V, V_{GS} = 10 V I_D = 11 A, R_{GS} = 3.3 Ω	$t_{d(off)}$	–	70	–	
	t_f	–	55	–	

Electrical Characteristics (cont'd)
at T_j = 25 °C, unless otherwise specified.

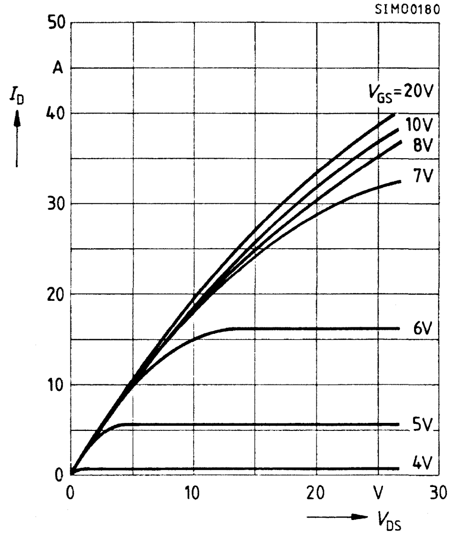
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Fast-recovery reverse diode					
Continuous reverse drain current T_C = 25 °C	I_S	–	–	18	A
Pulsed reverse drain current T_C = 25 °C	I_{SM}	–	–	72	
Diode forward on-voltage I_F = 36 A , V_{GS} = 0	V_{SD}	–	1.2	1.6	V
Reverse recovery time $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	t_{rr}	 – –	 220 350	 300 500	ns
Reverse recovery charge $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	Q_{rr}	 – –	 1.5 8.5	 2.5 13	µC
Repetitive peak reverse current $I_F = I_S$, di_F/dt = 100 A/ µs, V_R = 100 V T_j = 25 °C T_j = 150 °C	I_{RRM}	 – –	 12 30	 – –	A

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

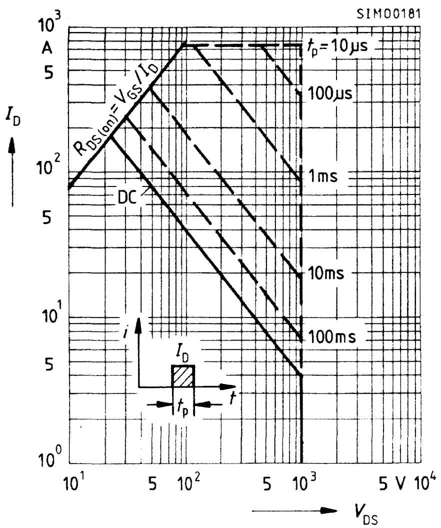
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



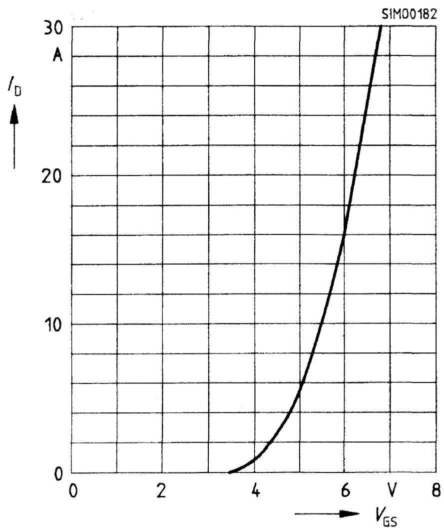
Typ. output characteristics $I_D = f(V_{DS})$
parameter: t_p = 80 µs



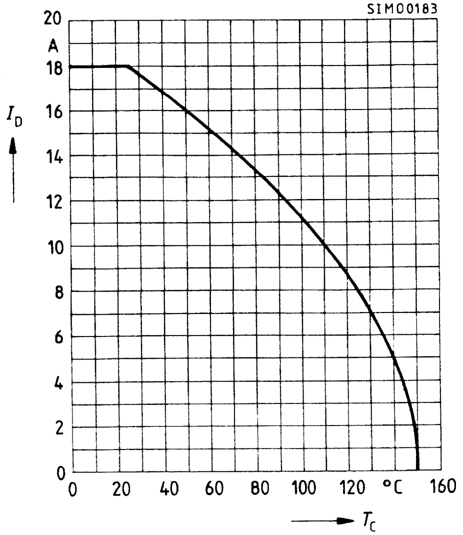
Safe operating area $I_D = f(V_{DS})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



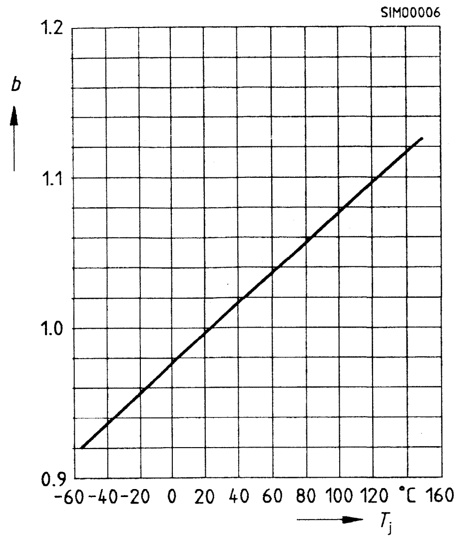
Typ. transfer characteristic $I_D = f(V_{GS})$
parameter: t_p = 80 µs , V_{DS} = 25 V



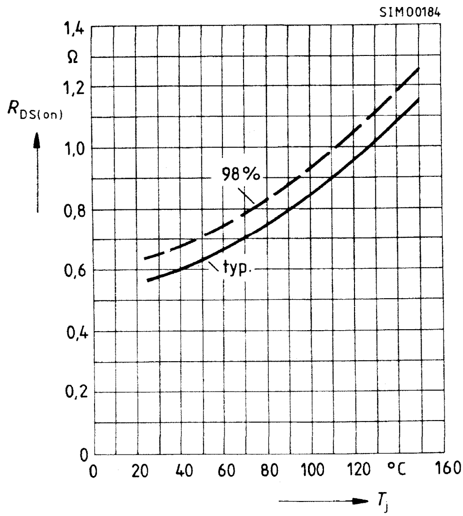
Drain current $I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V, T_j = 150 °C



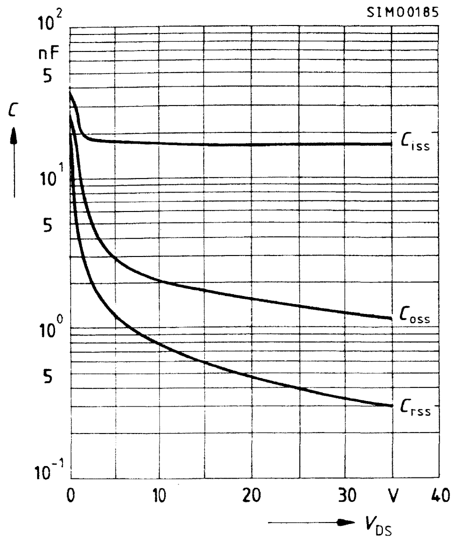
Drain-source breakdown voltage
$V_{(BR)DSS}(T_j) = b \times V_{(BR)DSS}$ **(25 °C)**



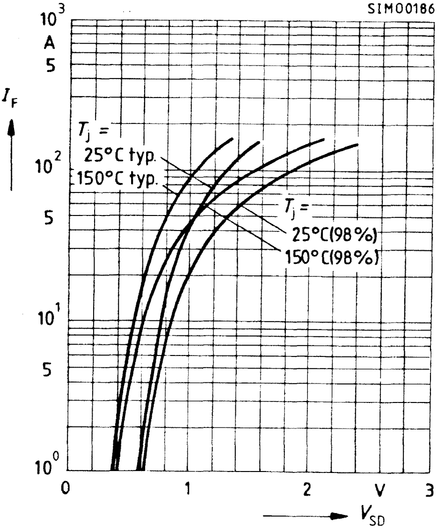
Drain source on-state resistance
$R_{DS(on)} = f(T_j)$
parameter: I_D = 11 A; V_{GS} = 10 V, (spread)



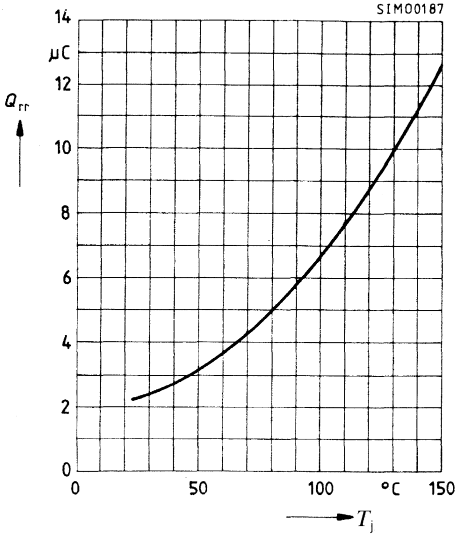
Typ. capacitances $C = f(V_{DS})$
parameter: V_{GS} = 0; f = 1 MHz



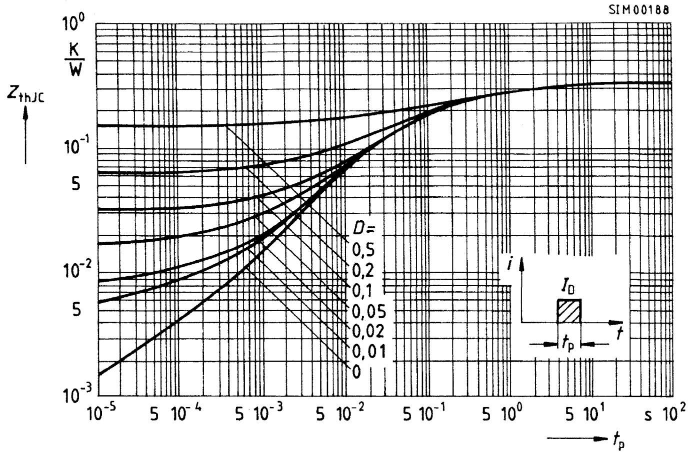
Forward characteristics of fast-recovery reverse diode $I_F = f(V_{SD})$
parameter: T_j, t_p = 80 µs (spread)



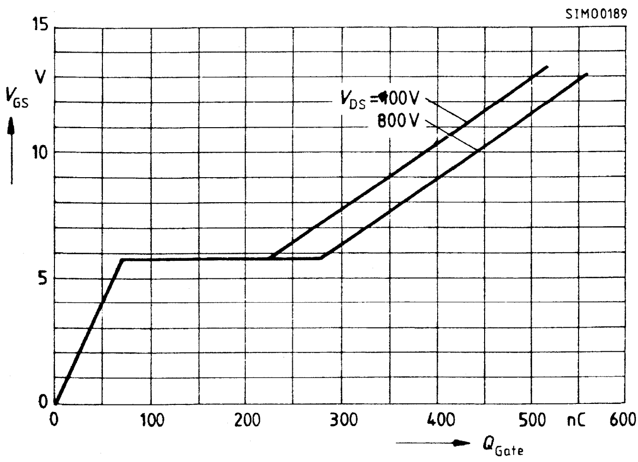
Typ. reverse recovery charge $Q_{rr} = f(T_j)$
parameter: di/dt = 100 A/µs, I_F = 35 A
V_R = 100 V



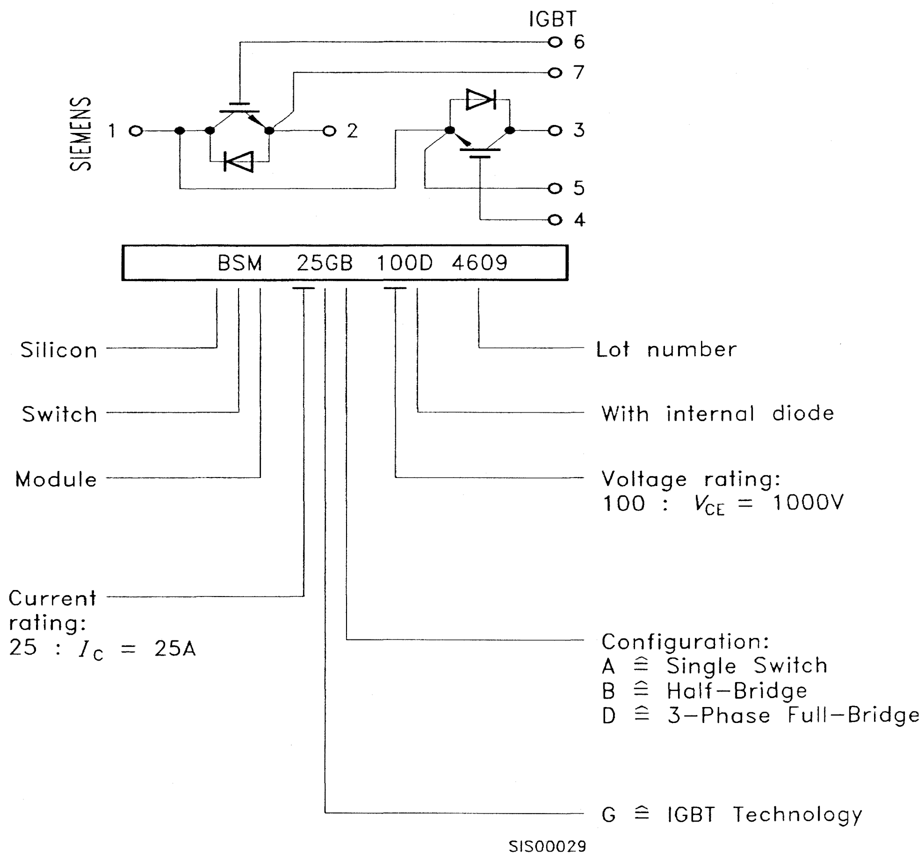
Transient thermal impedance $Z_{thJC} = f(t_p)$
parameter: $D = t_p/T$



Typ. gate charge $V_{GS} = f(Q_{Gate})$
parameter: I_{Dpuls} = 30 A



IGBT Modules



BSM xxx GAL 100D : Chopper; IGBT + Diode on Collector Side

IGBT Power Modules (Insulated Bipolar Transistors)

IGBT are MOS-controlled High-current/high-voltage switches for switching applications in the frequency range of 2 kHz ... > 20 kHz. When the IGBT is turned off, the tail current decays exponentially which determines the attainable switching frequency essentially. The tail current is independent on temperature and ranges from 5 to 10% of the rated I_C current. The selected design of the IGBT reliably prevents the possible latch-up effect at turn-off and shows a square-wave RBSOA diagram. In the case of a short circuit, the collector current is, for a given gate voltage, almost independant of the collector-emitter voltage over the entire range. Therefore, no "thermal surges" occur. The short-circuit current can be turned-off within 10µs without any problems.

1000 V IGBT Power Modules

Collector current I_C at T_C = 80 °C	V_{CE} = 1000 V			
	Single switch	Half-bridge	Chopper	3-phase full-bridge
5 A[1]	–	–	–	BSM 05 GD 100 D[2]
10 A[1]	–	–	–	BSM 10 GD 100 D[2]
15 A	–	–	–	BSM 15 GD 100 D
25 A	–	BSM 25 GB 100 D	BSM 25 GAL 100 D	BSM 15 GD 100 D
50 A	–	BSM 50 GB 100 D	BSM 50 GAL 100 D	–
75 A	–	BSM 75 GB 100 D	BSM 75 GAL 100 D	–
100 A	–	BSM 100 GB 100 D	BSM 100 GAL 100 D	–
150 A	–	BSM 150 GB 100 D	BSM 150 GAL 100 D	–
200 A	BSM 200 GA 100 D	–	–	–
300 A	BSM 300 GA 100 D	–	–	–

1200 V IGBT Power Modules

Collector current I_C at T_C = 80 °C	VCE = 1200 V			
	Single switch	Half-bridge	Chopper	3-phase full-bridge
15 A	–	–	–	BSM 15 GD 120 D
25 A	–	BSM 25 GB 120 D	BSM 25 GAL 120 D	BSM 15 GD 120 D
50 A	–	BSM 50 GB 120 D	BSM 50 GAL 120 D	–
75 A	–	BSM 75 GB 120 D	BSM 75 GAL 120 D	–
100 A	–	BSM 100 GB 120 D	BSM 100 GAL 120 D	–
150 A	–	BSM 150 GB 120 D	BSM 150 GAL 120 D	–
200 A	BSM 200 GA 120 D	–	–	–
300 A	BSM 300 GA 120 D	–	–	–

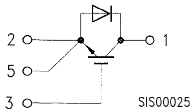
Application (selection)

- DC/AC drive systems
- Uninterruptible power systems (UPS)
- Switched-mode high-power supplies
- Welding equipment

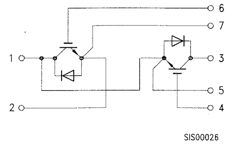
1) At T_C = 40 °C
2) ECONOPACK

Circuit Diagrams

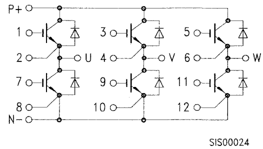
Single switch



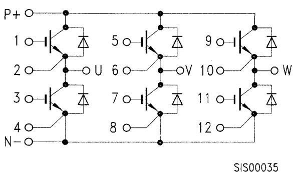
Half-bridge



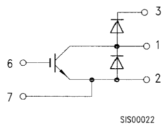
3-phase full-bridge



3-phase full-bridge
ECONOPACK

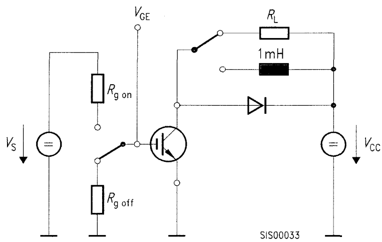


Choppers

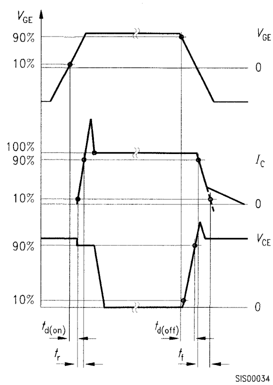


Measurement of Switching Times

Test circuit



Definition of switching times



Definition of turn-off loss

$$E_{off} = E_{off\,1} + E_{off\,2} \qquad \Delta V_{CE} \leq 0.2 \times V_{CE}$$

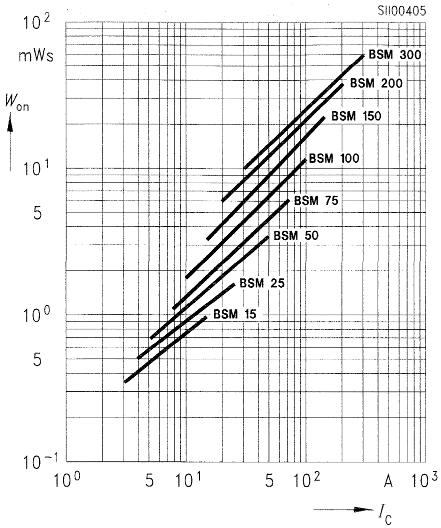
$$I_{t0} \approx 0.1 \times I_C$$

$$E_{off\,1} = \int_{t_1}^{t_2} V_{CE(t)} \times i_C \, dt$$

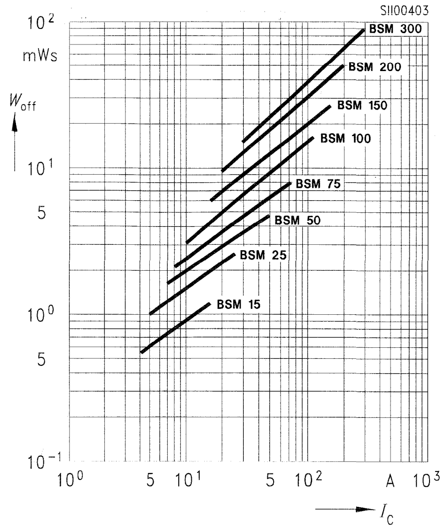
$$E_{off\,2} = \int_{t_2}^{t_3} V_{CE(t)} \times i_C \, dt$$

Turn-on/ turn-off energy dissipation per pulse

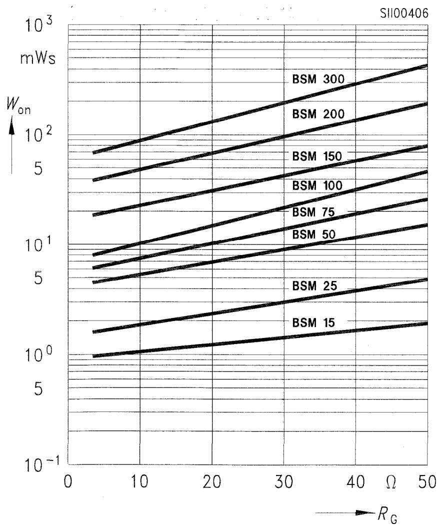
$W_{on} = f(I_C)$



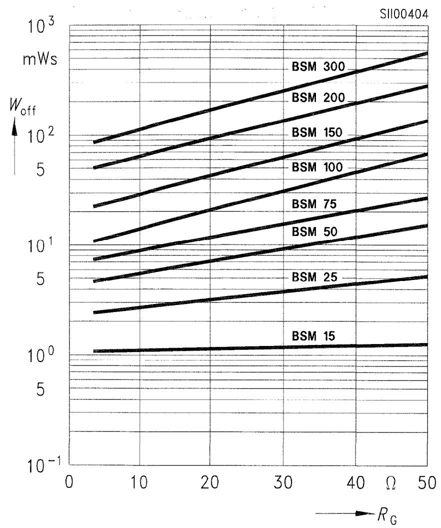
$W_{off} = f(I_C)$



$W_{on} = f(R_G)$



$W_{off} = f(R_g)$



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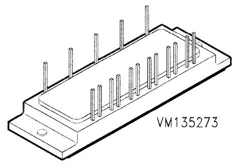
IGBT Module
Preliminary Data

BSM 05 GD 100 D

V_{CE} = 1000 V
I_C = 6 x 5.5 A at T_C = 25 °C
I_C = 6 x 5.0 A at T_C = 40 °C

- Power module
- 3-phase full bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 6a[1]



Type	Ordering Code
BSM 05 GD 100 D	C67076-A2506-A52

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 40 °C	I_C	5.5 5.0	A
Pulsed collector current, T_C = 25 °C T_C = 40 °C	$I_{C\ puls}$	11.0 10.0	
Storage temperature range	T_{stg}	- 40 ... + 125	°C
Junction Temperature	T_j	150	
Power dissipation, T_C = 40 °C	P_{tot}	30	W
Thermal resistance, chip-case	R_{thJC}	≤ 4.0	K/W
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	40/125/56	

[1] See chapter Package Outline and Circuit Diagrams.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 0.3 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 0.3 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 5 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 300 1000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	0.1	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 5 A	g_{fs}	1.5	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	650	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	50	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	20	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	$t_{d (on)}$	–	15	–	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	t_r	–	100	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	$t_{d (off)}$	–	120	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	t_f	–	150	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	$t_{d (on)}$	5 –	12 –	20 –	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	t_r	5 –	10 –	15 –	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	$t_{d (off)}$	90 –	120 –	150 –	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	t_f	10 –	15 –	20 –	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 5 A $R_{g (on)}$ = 3.3 Ω, $R_{g (off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	0.25 0.35	– –	mWs

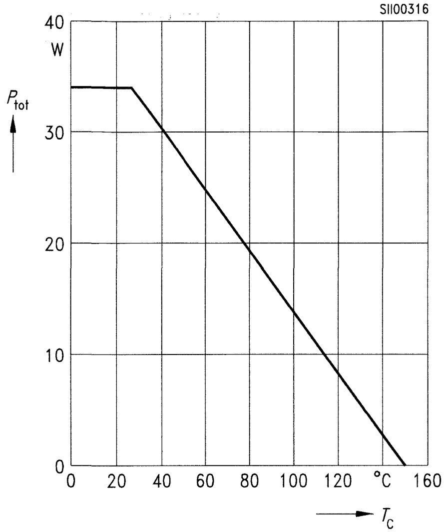
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

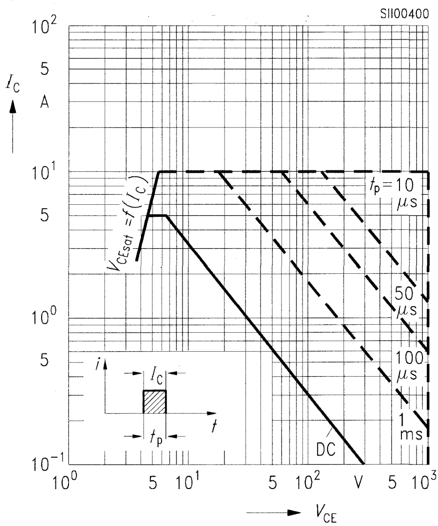
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 5 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 1.8 1.6	 – –	V
Reverse recovery time I_F = 5 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 500 A/µs T_j = 125 °C	t_{rr}	 –	 0.05	 –	µs
Reverse recovery charge I_F = 5 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 500 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 0.5 1.0	 – –	µC
Soft factor I_F = 5 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 500 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	6.0	K/W

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

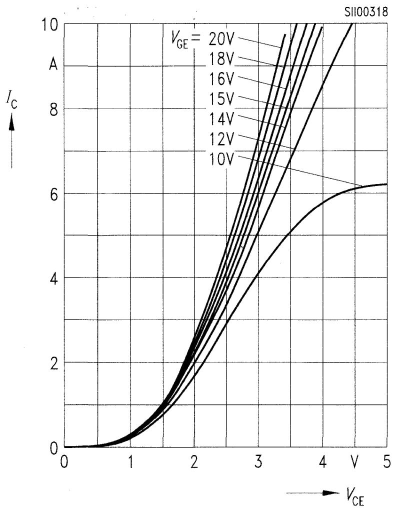
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



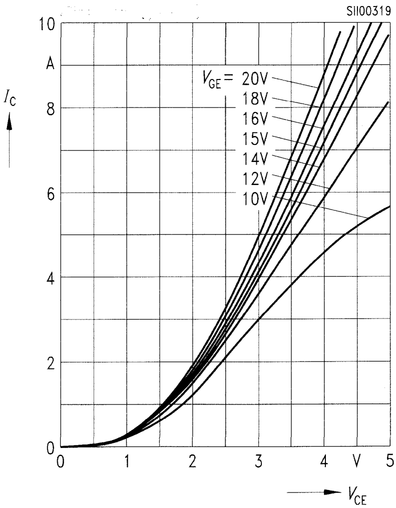
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



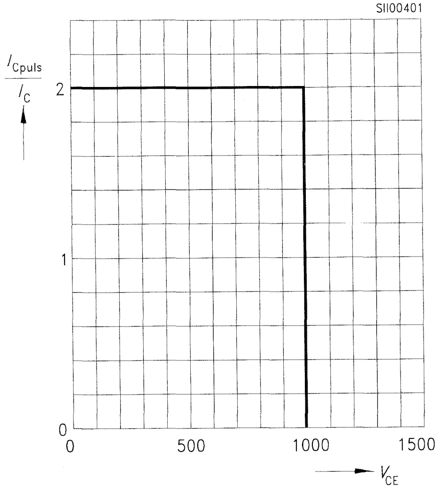
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



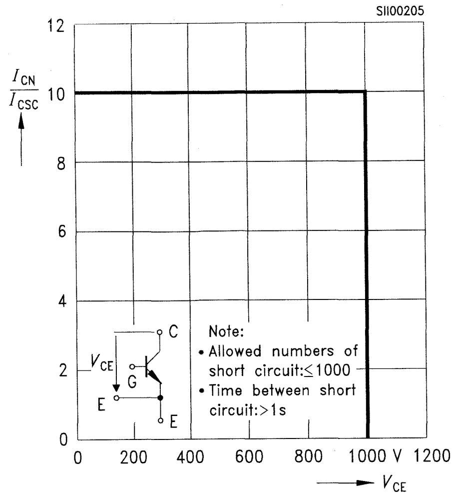
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



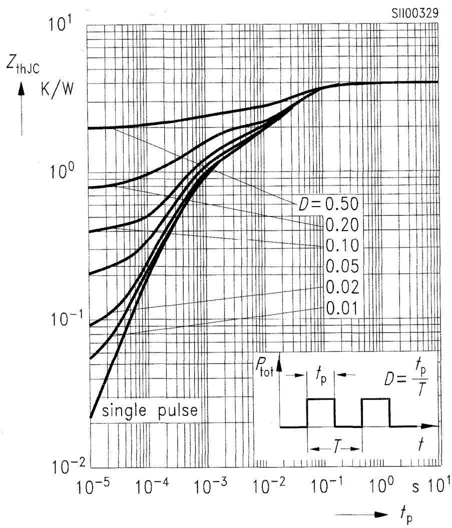
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



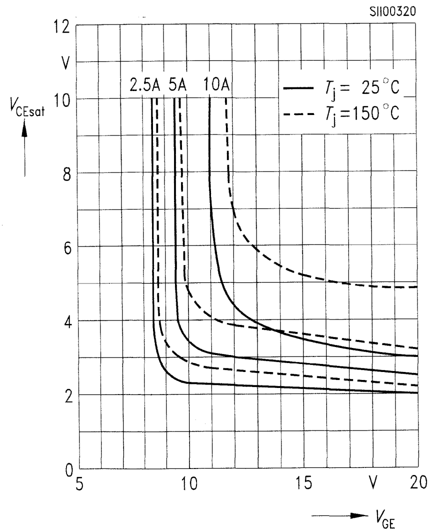
Safe operating area, short circuit $I_C = f(V_{CE})$, $V_{GE} = \pm$ 15 V
$T_j \leq$ 150 °C, $t_{SC} \leq$ 10 µs, L < 50 nH



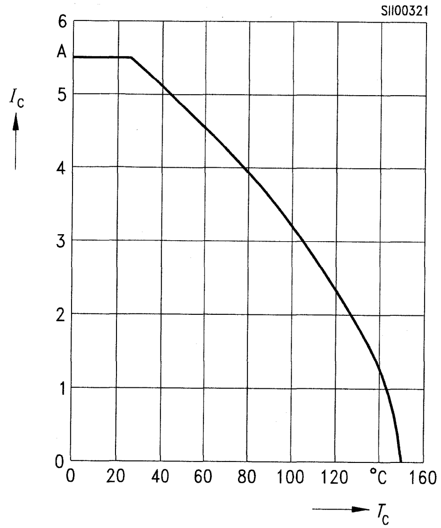
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



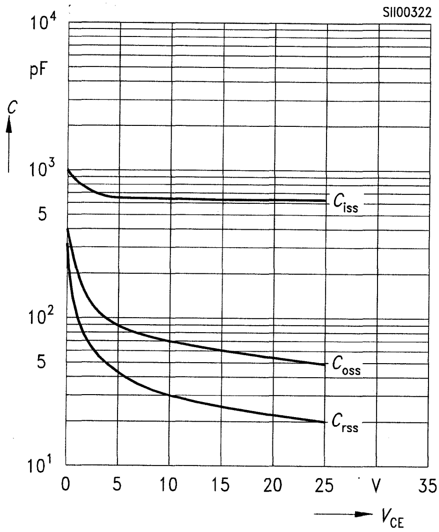
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



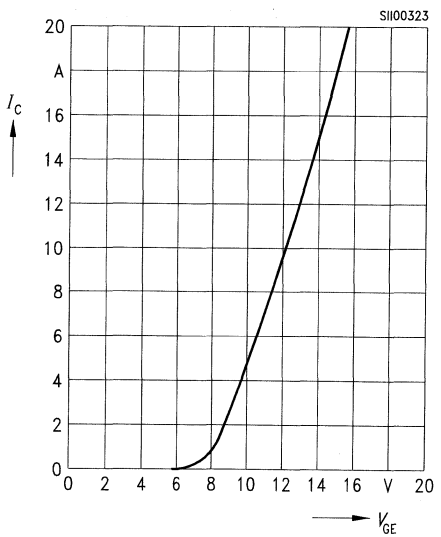
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



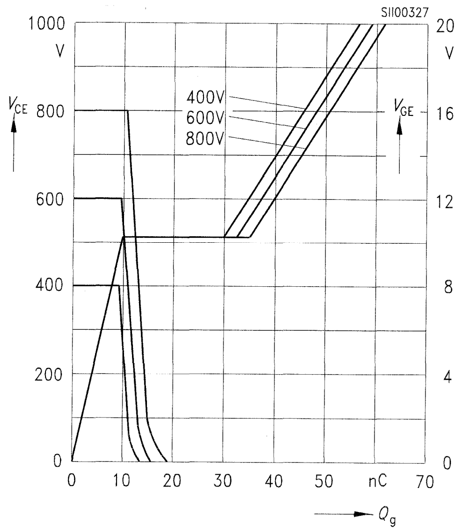
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



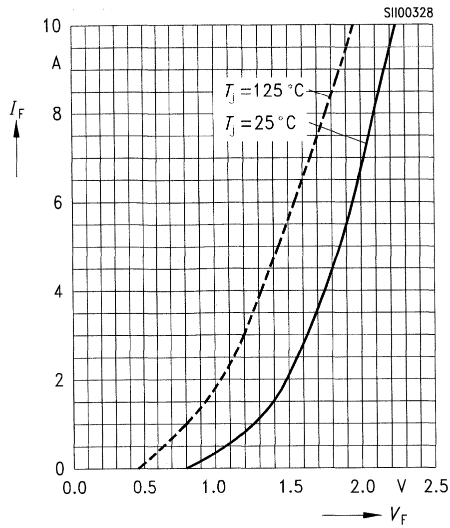
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



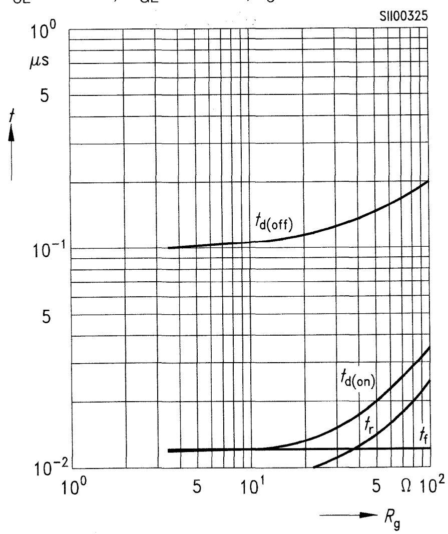
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



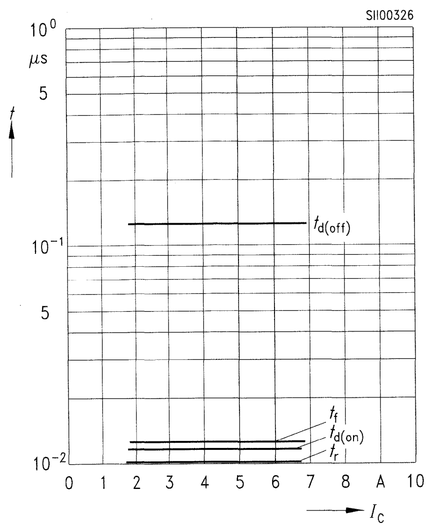
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 5 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 3.3 Ω



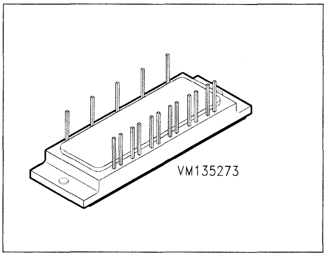
SIEMENS

IGBT Module **BSM 10 GD 100 D**

Preliminary Data

V_{CE} = 1000 V
I_C = 6 x 11 A at T_C = 25 °C
I_C = 6 x 10 A at T_C = 40 °C

- Power module
- 3-phase full bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 6a[1)]



Type	Ordering Code
BSM 10 GD 100 D	C67076-A2507-A52

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 40 °C	I_C	11 10	A
Pulsed collector current, T_C = 25 °C T_C = 40 °C	$I_{C\ puls}$	22 20	
Storage temperature range	T_{stg}	- 40 ... + 125	°C
Junction Temperature	T_j	150	
Power dissipation, T_C = 40 °C	P_{tot}	50	W
Thermal resistance, chip-case	R_{thJC}	≤ 2.5	K/W
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	40/150/56	

1) See chapter Package Outline and Circuit Diagrams.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 0.15 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 0.7 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 10 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 500 2000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	0.1	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 10 A	g_{fs}	3.5	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	1300	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	100	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	50	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	–	15	–	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	150	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	140	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	200	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	10 –	15 –	20 –	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	5 –	10 –	15 –	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	100 –	140 –	170 –	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	10 –	18 –	25 –	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 10 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	0.5 0.6	– –	mWs

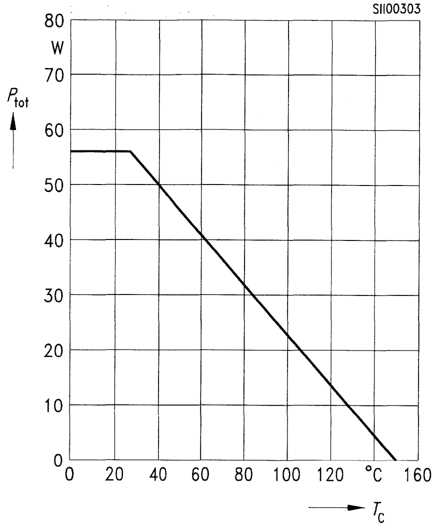
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

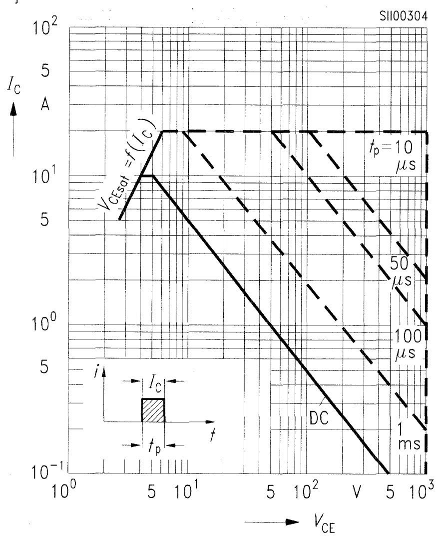
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 10 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 1.8 1.6	 – –	V
Reverse recovery time I_F = 10 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 500 A/µs T_j = 125 °C	t_{rr}	 –	 0.08	 –	µs
Reverse recovery charge I_F = 10 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 500 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 0.8 2.5	 – –	µC
Soft factor I_F = 10 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 500 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	4.5	K/W

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

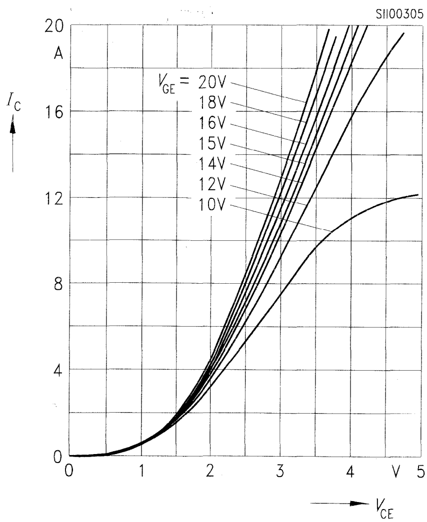
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



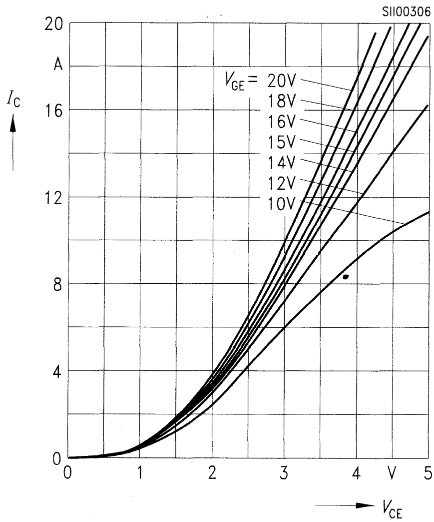
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
T_j ≤ 150 °C



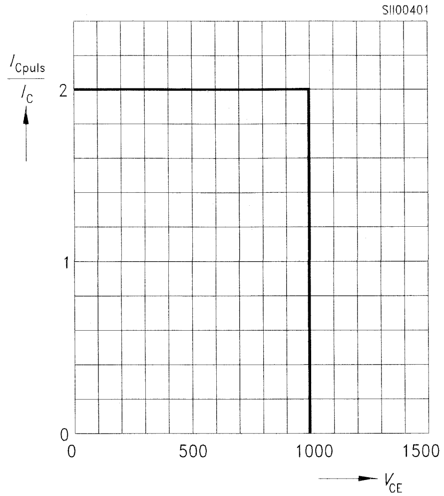
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, T_j ≤ 25 °C



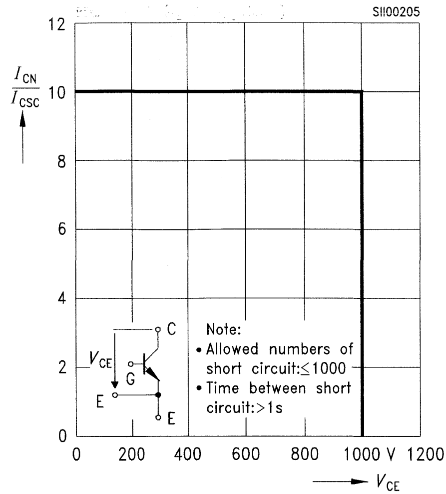
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, T_j ≤ 125 °C



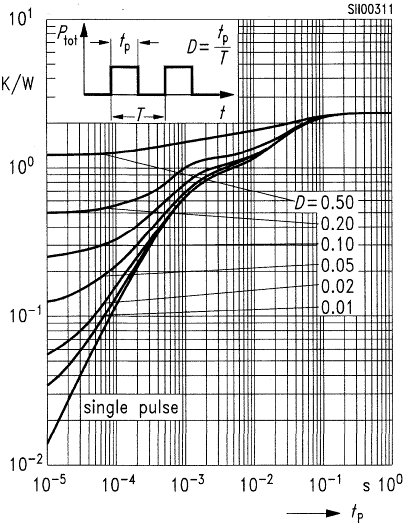
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



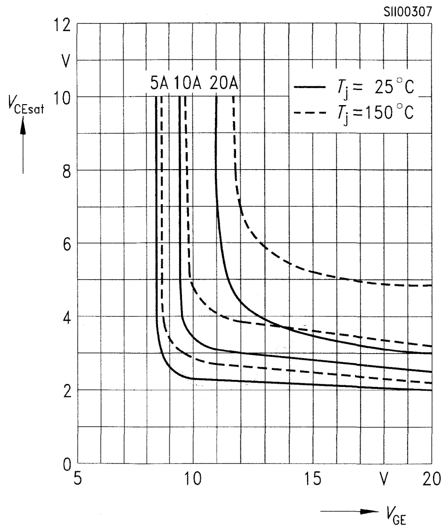
Safe operating area, short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



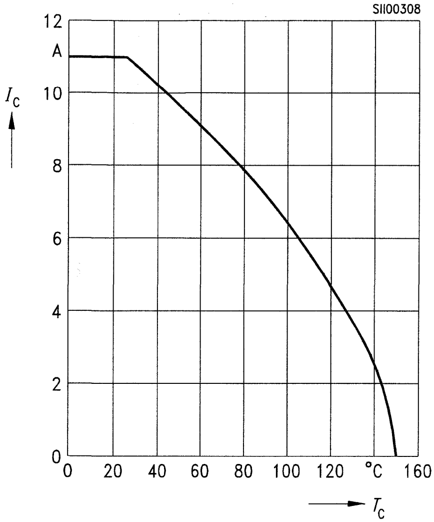
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



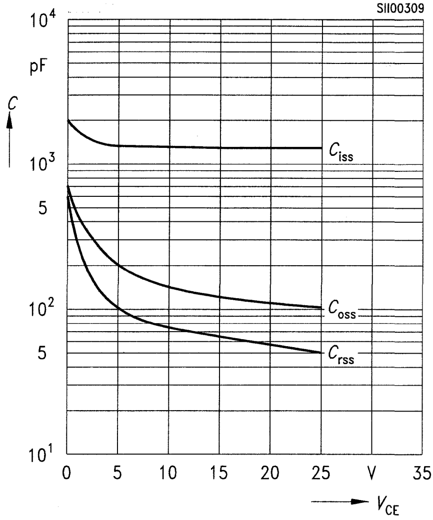
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



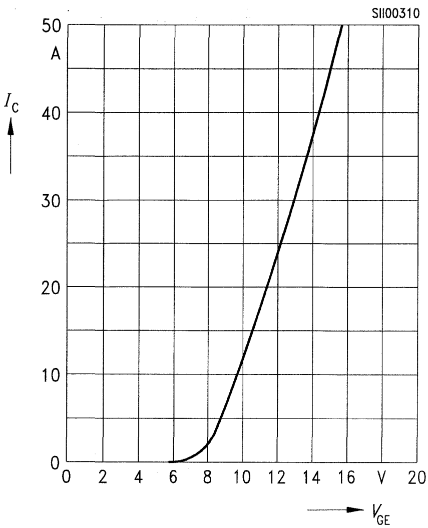
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



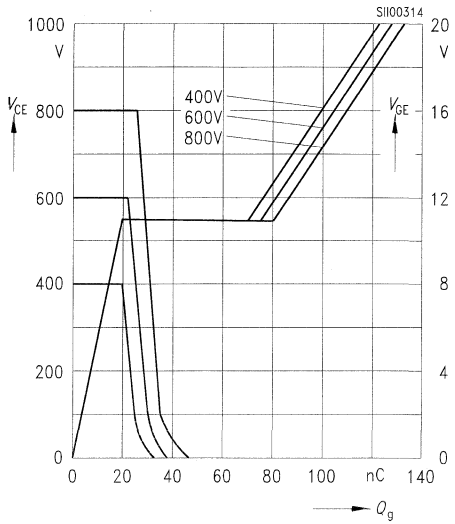
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



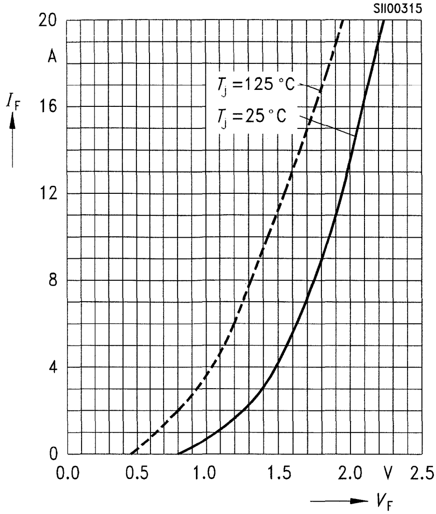
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



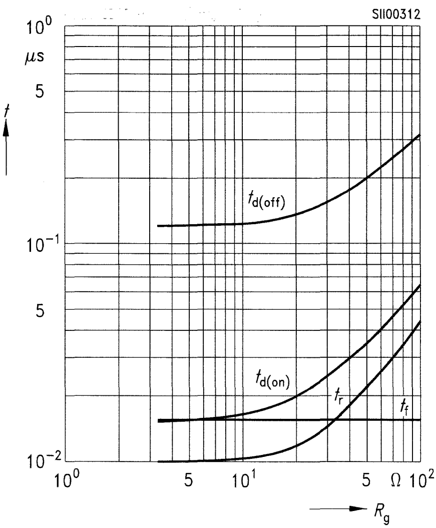
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



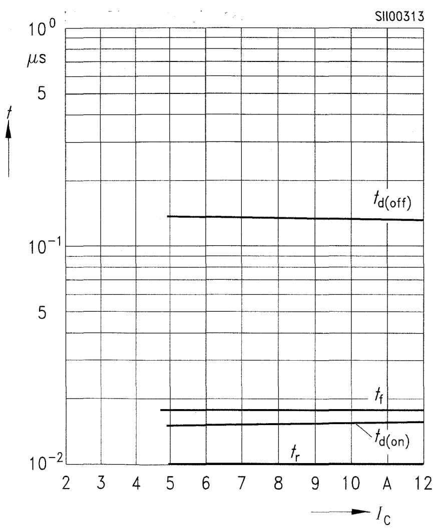
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 10 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 3.3 Ω



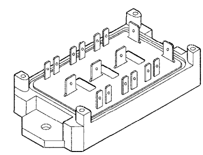
SIEMENS

IGBT Module **BSM 15 GD 100 D**

Preliminary Data

V_{CE} = 1000 V
I_C = 6 x 25 A at T_C = 25 °C
I_C = 6 x 15 A at T_C = 80 °C

- Power module
- 3-phase full bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 3a[1)]


VM305171

Type	Ordering Code
BSM 15 GD 100 D	C67076-A2500-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	25 15	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\,puls}$	50 30	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	150	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.8	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 0.5 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 1 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 15 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 500 2000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 15 A	g_{fs}	4.5		–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	2000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	160	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	65	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	10	15	20	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	200	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	150	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	300	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	10	15	20	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	5	10	15	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	110	150	180	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	15	20	25	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	0.7 0.8	– –	mWs

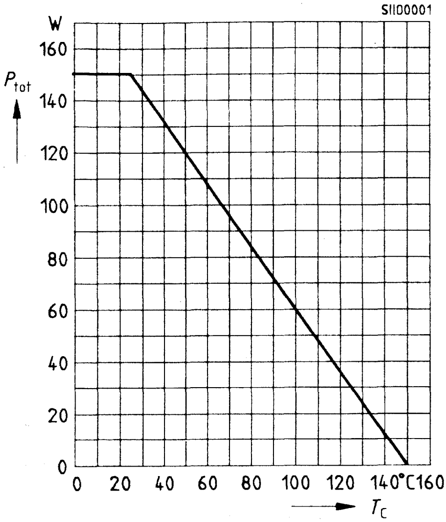
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

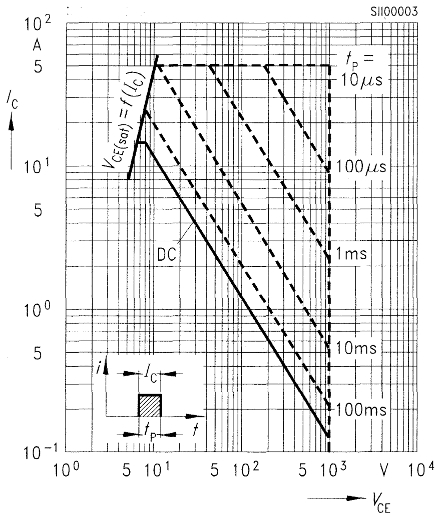
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 15 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 1.85 1.5	 – –	V
Reverse recovery time I_F = 15 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.1	 –	µs
Reverse recovery charge I_F = 15 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 1 4	 – –	µC
Soft factor I_F = 15 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	1.7	K/W

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

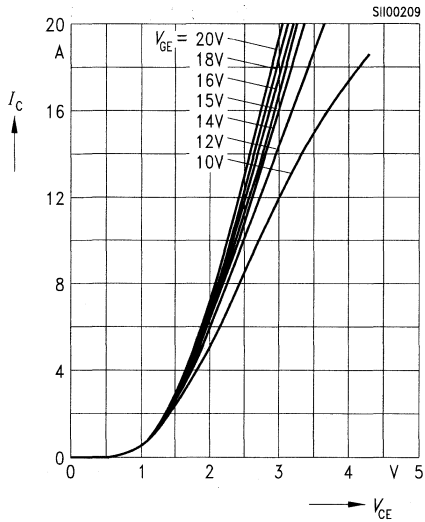
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



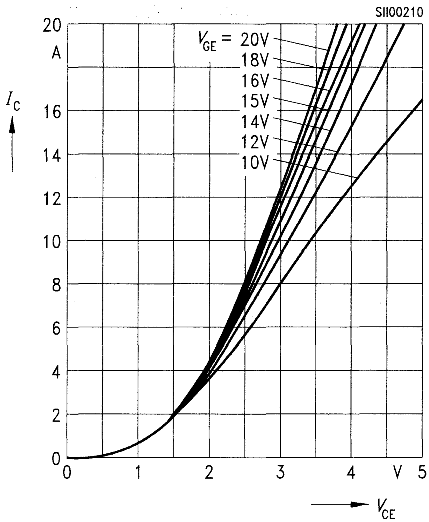
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq 150$ °C



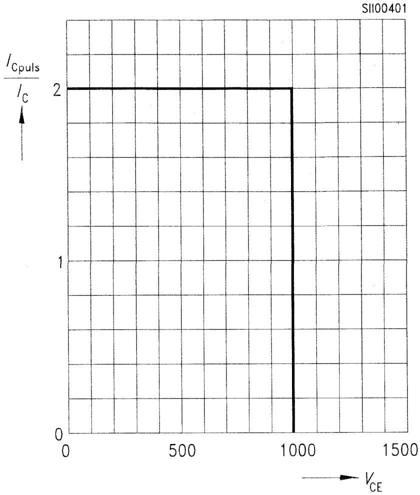
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq 25$ °C



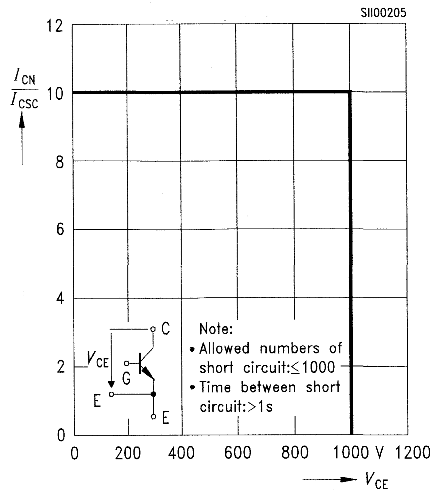
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq 125$ °C



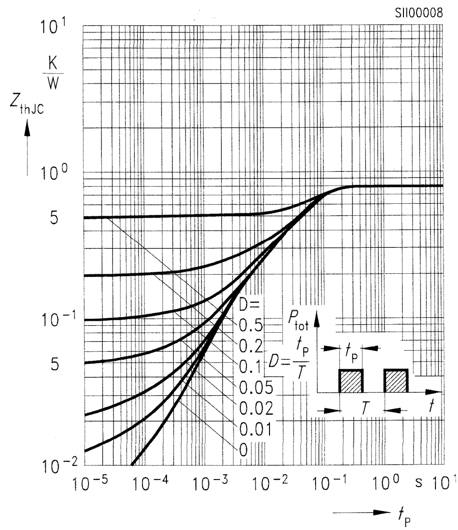
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



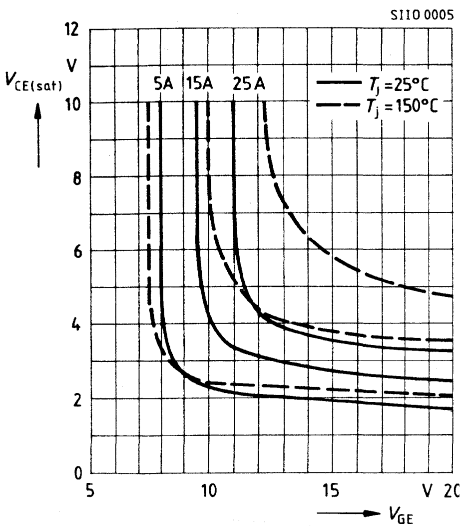
Safe operating area, short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



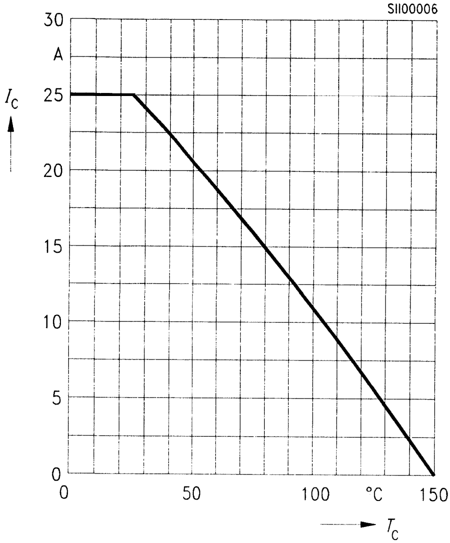
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



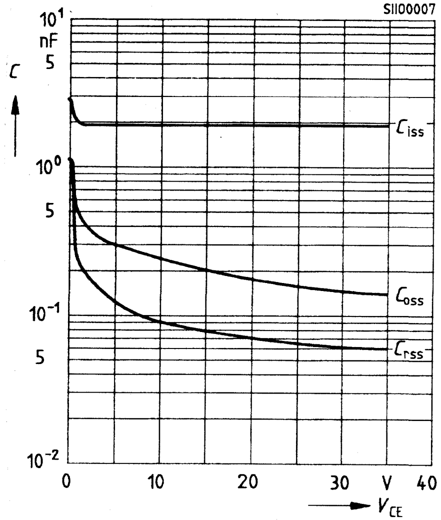
Typ. on-state characteristics
$V_{CE\,(sat)} = f(V_{GE})$, parameter: I_C, T_j



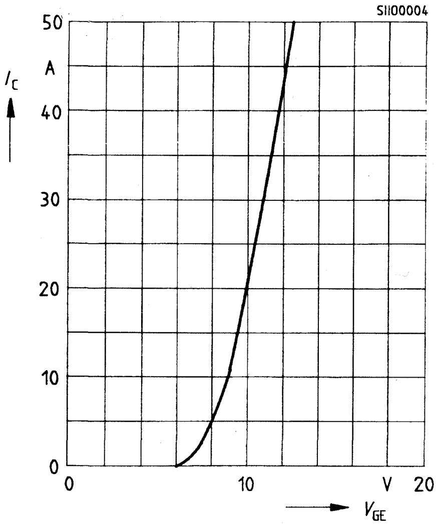
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



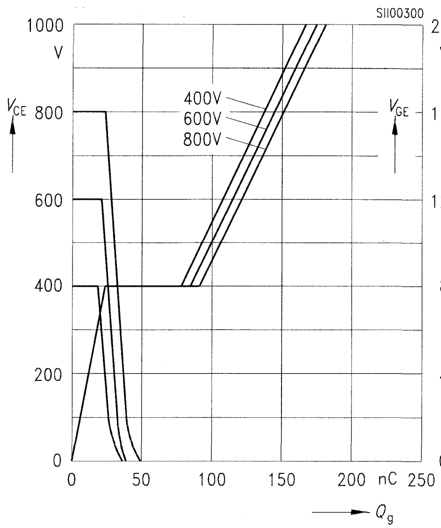
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



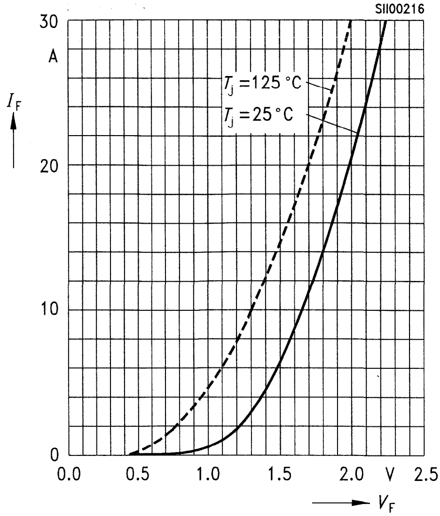
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



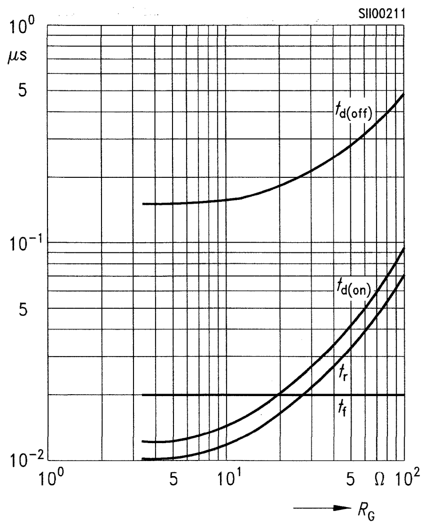
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



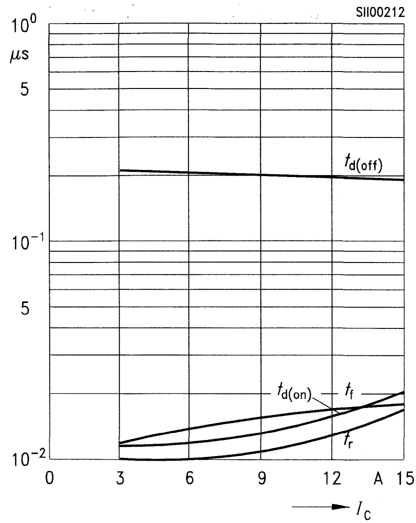
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 15 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



SIEMENS

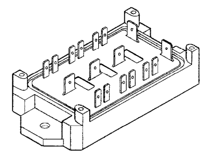
IGBT Module

BSM 15 GD 120 D

Preliminary Data

V_{CE} = 1200 V
I_C = 6 x 25 A at T_C = 25 °C
I_C = 6 x 15 A at T_C = 80 °C

- Power module
- 3-phase full bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 3[1]



VM305171

Type	Ordering Code
BSM 15 GD 120 D	C67076-A2504-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	25 15	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	50 30	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	150	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.8	K/W
Insulation test voltage[2], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 0.5 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 1 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 15 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 500 2000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 150 A	g_{fs}	4.5		–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	2000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	·160	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	65	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

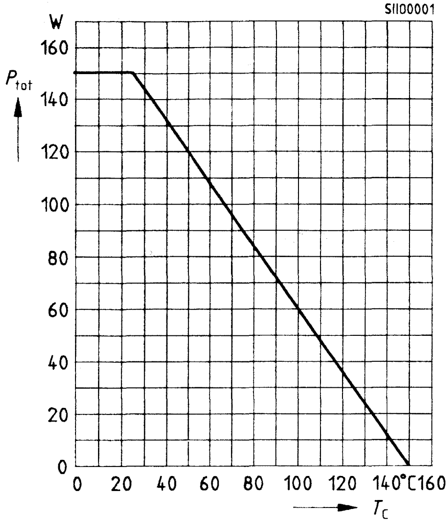
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	10	15	20	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	200	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	150	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	300	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	10	15	20	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	5	10	15	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	110	150	180	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	15	20	25	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 15 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	0.7 0.8	– –	mWs

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

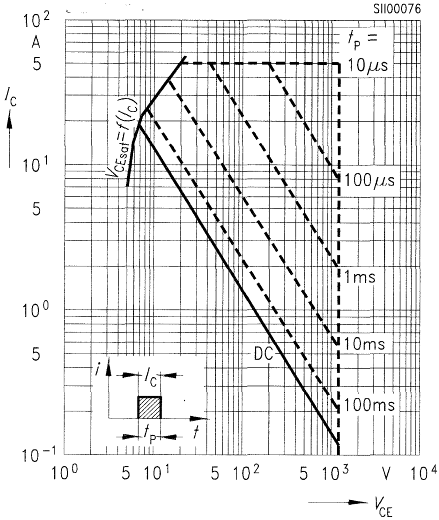
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 15 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.5 1.7	 – –	V
Reverse recovery time I_F = 15 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.1	 –	µs
Reverse recovery charge I_F = 15 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 1 4	 – –	µC
Soft factor I_F = 15 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	1.7	K/W

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

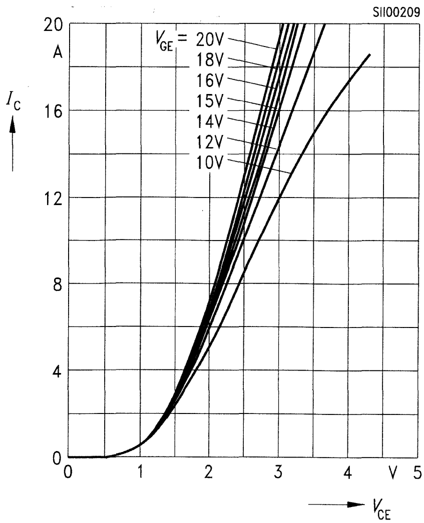
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



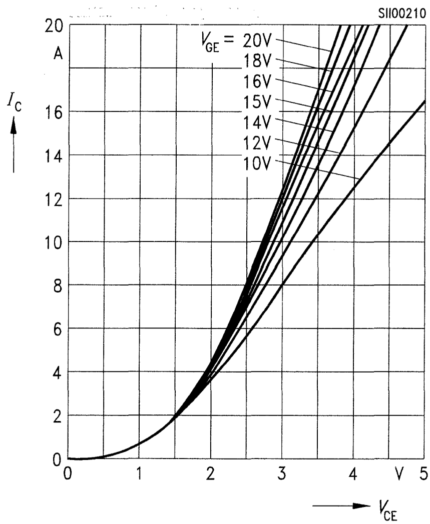
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C

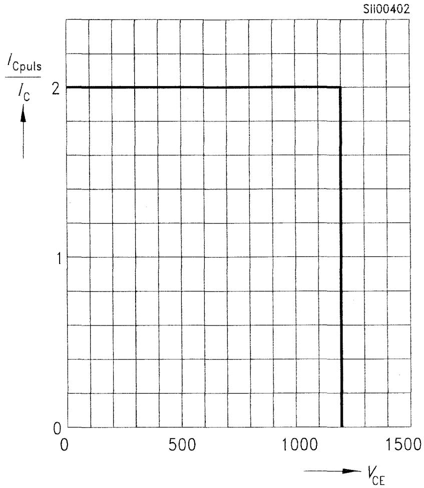


Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



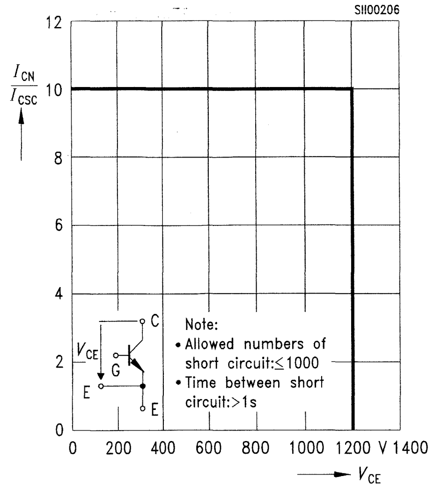
Reverse biased safe operating area

$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



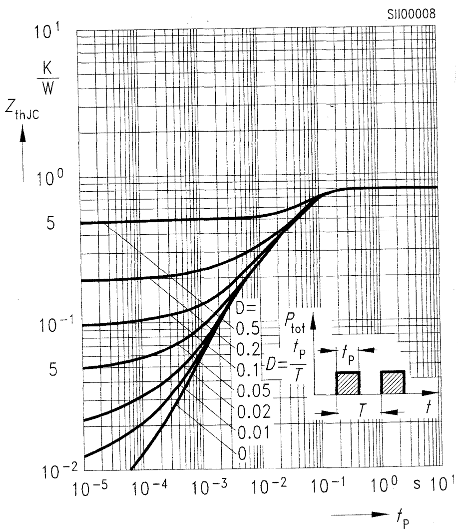
Safe operating area, short circuit

$I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 80 nH



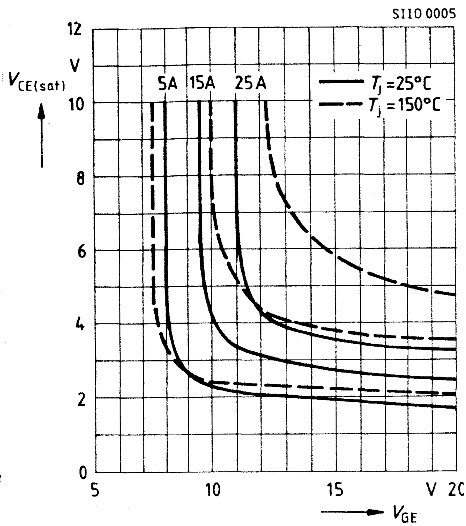
Transient thermal impedance

$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$

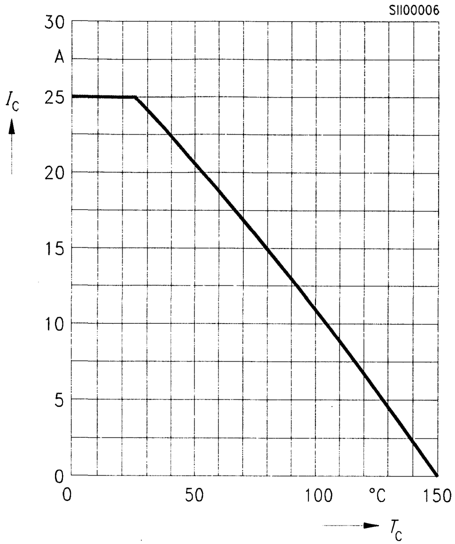


Typ. on-state characteristics

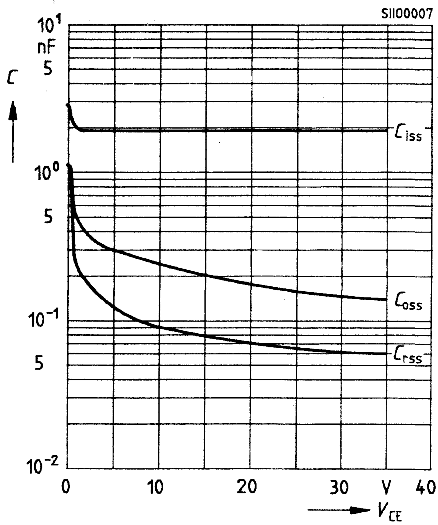
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



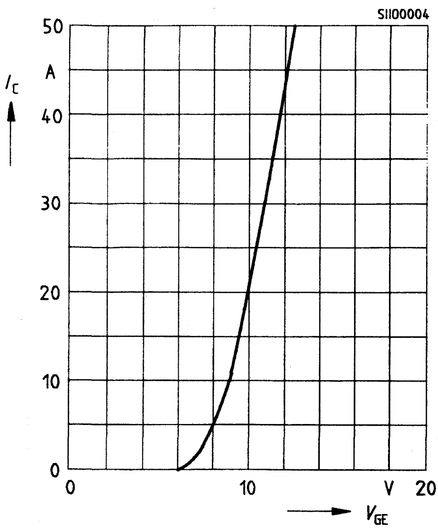
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



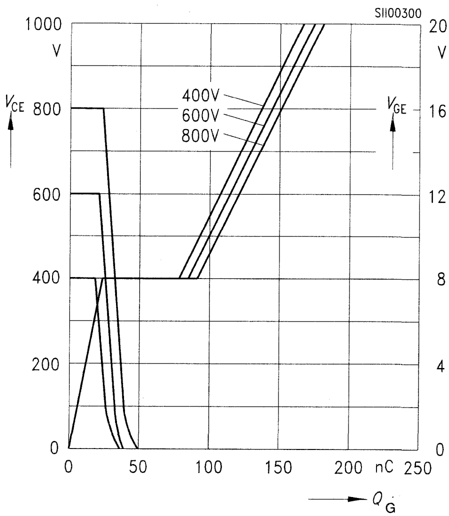
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



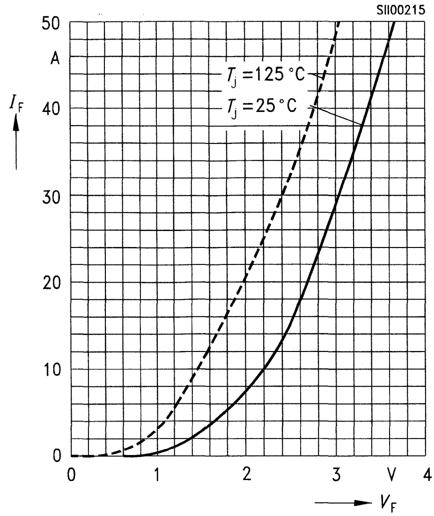
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



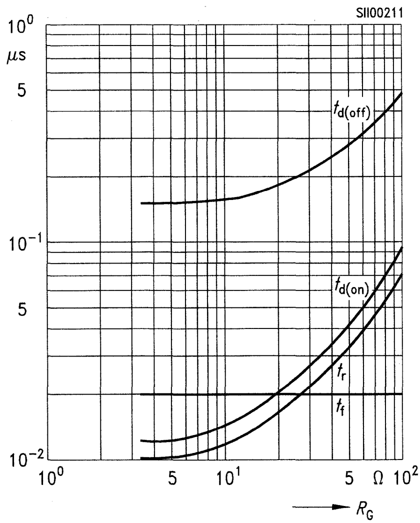
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



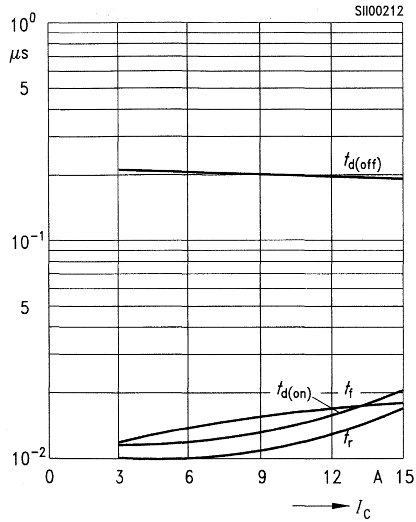
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 15 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



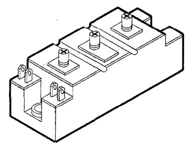
SIEMENS

IGBT Module
Preliminary Data

BSM 25 GB 100 D
BSM 25 GAL 100 D

V_{CE} = 1000 V
I_C = 2 x 35 A at T_C = 25 °C
I_C = 2 x 25 A at T_C = 80 °C

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 2b, 2c[1)]



Half-bridge		Chopper	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 25 GB 100 D	C67076-A2101-A2	BSM 25 GAL 100 D	C67076-A2008-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	35 25	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	70 50	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	300	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.4	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 0.75 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 2 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 25 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 750 3000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 25 A	g_{fs}	9.0	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	4000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	320	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	130	–	

Switching Characteristics
at T_j = 125 °C, unless otherwise specified.

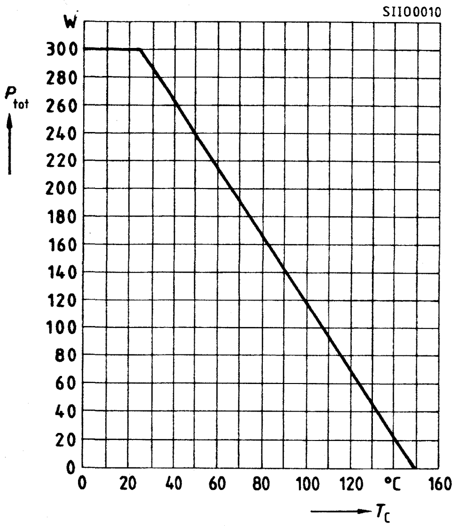
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	110	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	200	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	300	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	5	10	15	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	160	230	280	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	20	30	40	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	1.4 1.3		mWs

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

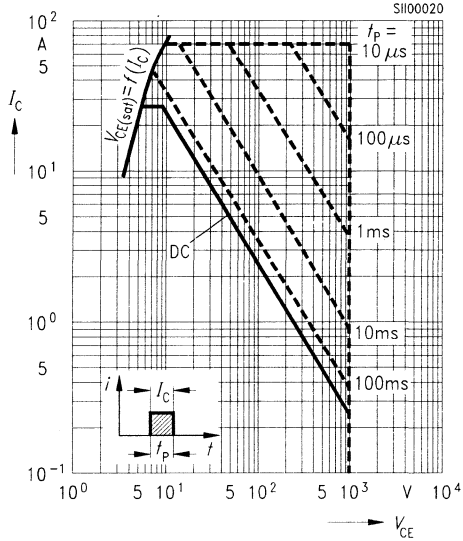
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 25 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 1.75 1.4	 – –	V
Reverse recovery time I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.13	 –	µs
Reverse recovery charge I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 2.3 6	 – –	µC
Soft factor I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	1.0	K/W

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

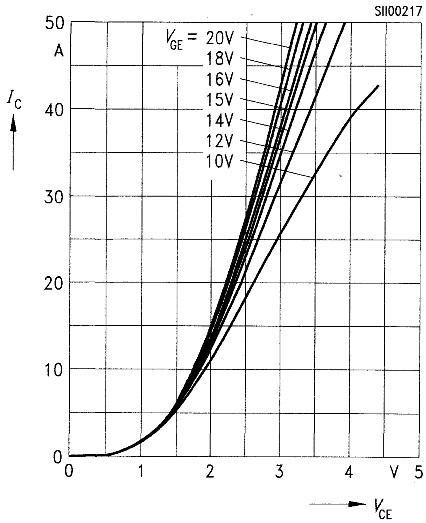
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



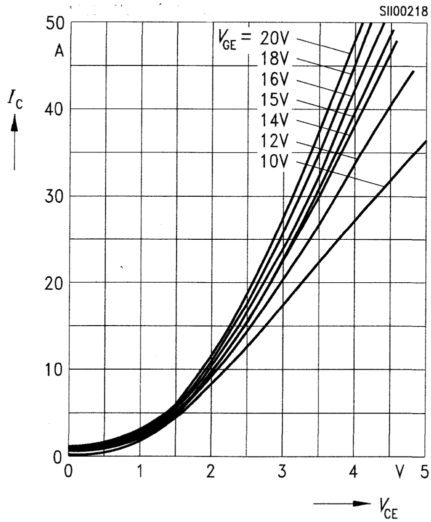
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



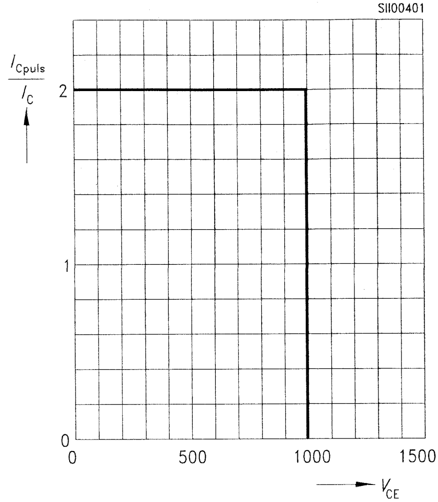
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



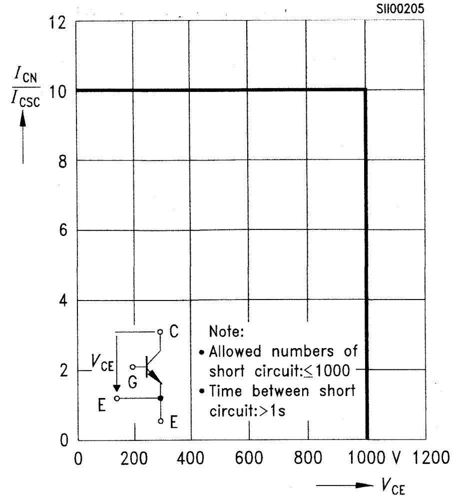
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



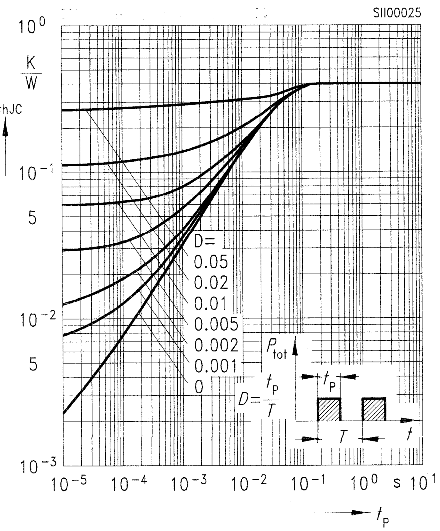
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



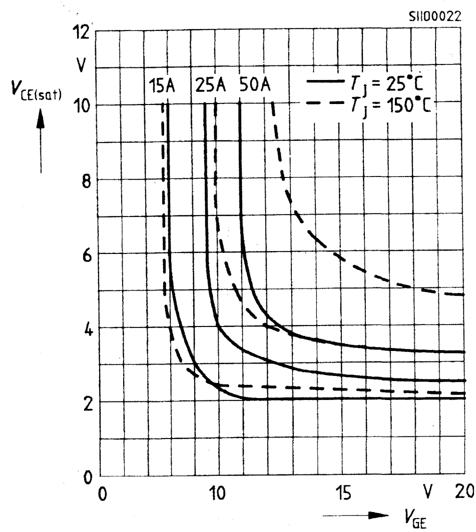
Safe operating area,
short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



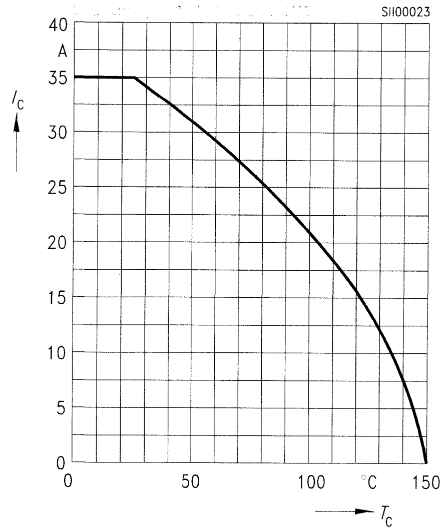
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



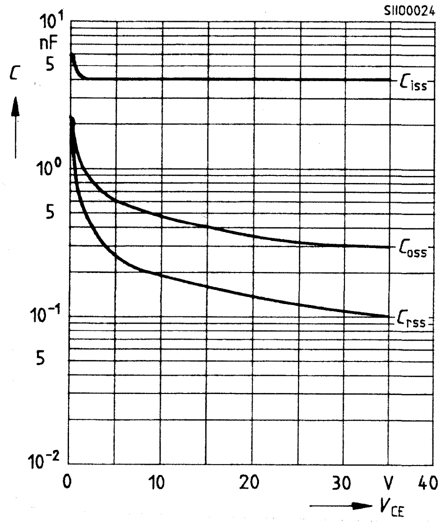
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



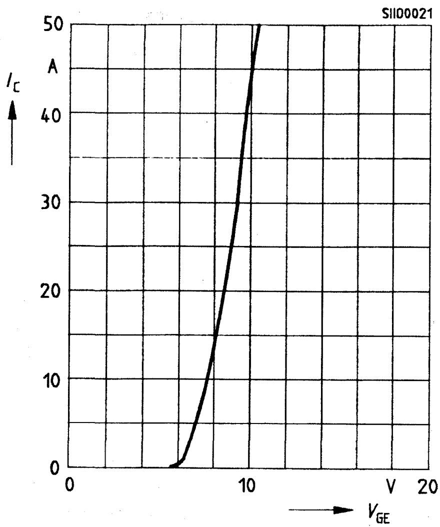
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



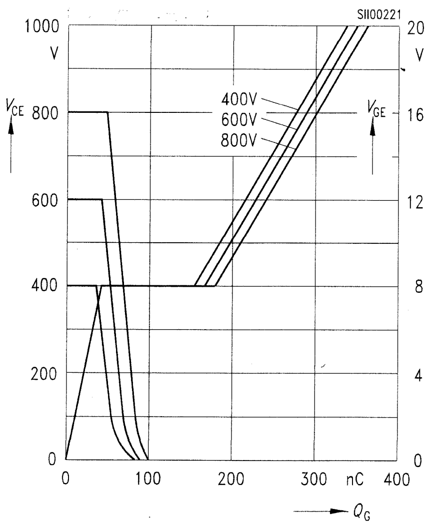
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0, f = 1$ MHz



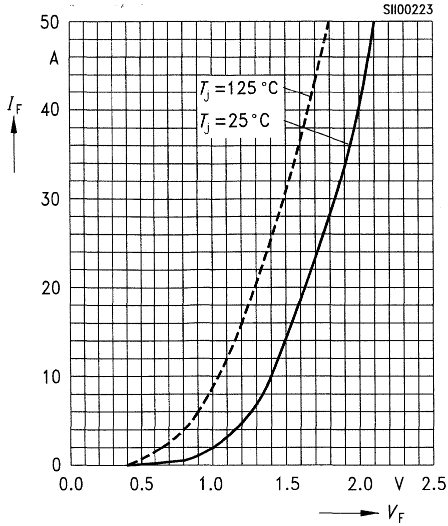
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



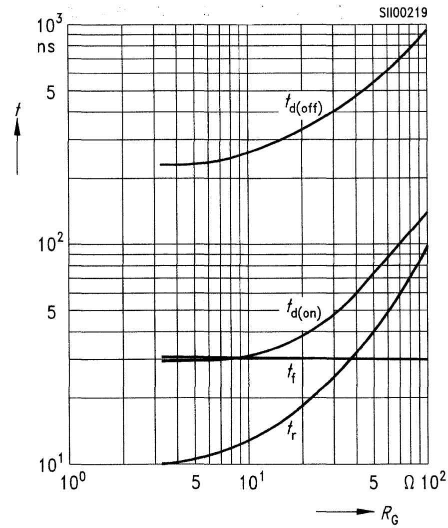
Typ. gate charge $V_{CE}, V_{GE} = f(Q_G)$



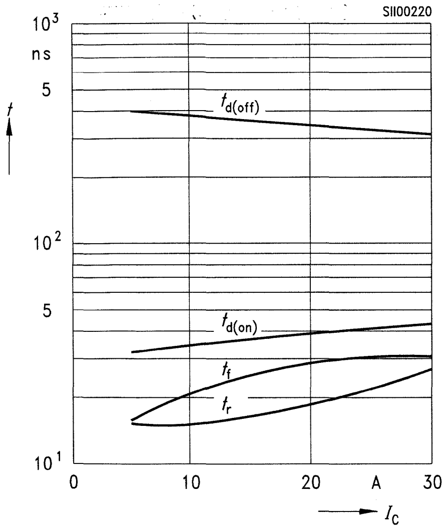
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 25 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



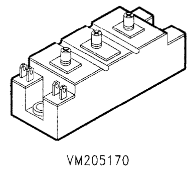
SIEMENS

IGBT Module
Preliminary Data

BSM 25 GB 120 D
BSM 25 GAL 120 D

V_{CE} = 1200 V
I_C = 2 x 35 A at T_C = 25 °C
I_C = 2 x 25 A at T_C = 80 °C

- Power module
- 3-phase full bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 2b, 2c[1)]



Half-bridge		Chopper	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 25 GB 120 D	C67076-A2109-A2	BSM 25 GAL 120 D	C67076-A2009-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	35 25	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	70 50	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	300	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.4	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 0.75 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 2 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 25 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 750 3000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 25 A	g_{fs}	9.0	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	4000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	320	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	130	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

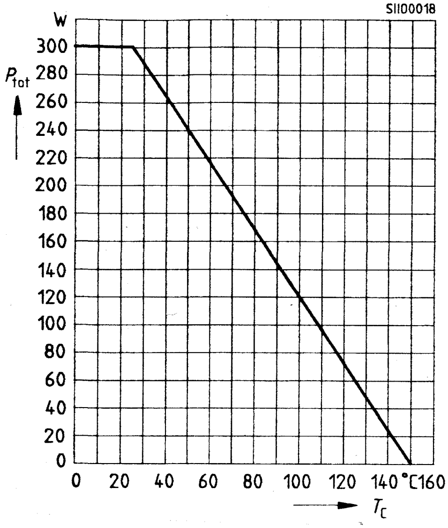
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	110	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	200	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	300	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	5	10	15	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	160	230	280	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	20	30	40	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	1.4 1.3		mWs

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

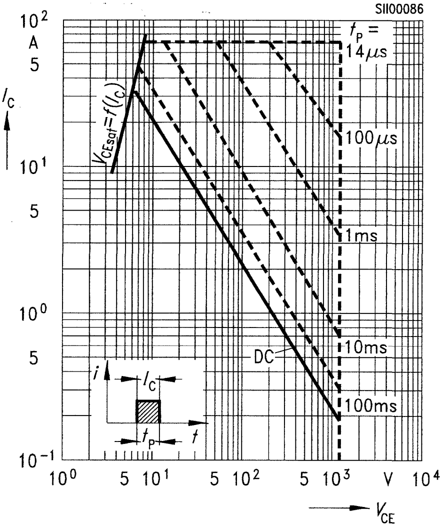
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 25 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.2 1.6	 – –	V
Reverse recovery time I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.13	 –	µs
Reverse recovery charge I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 2.3 6	 – –	µC
Soft factor I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	1.0	K/W

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

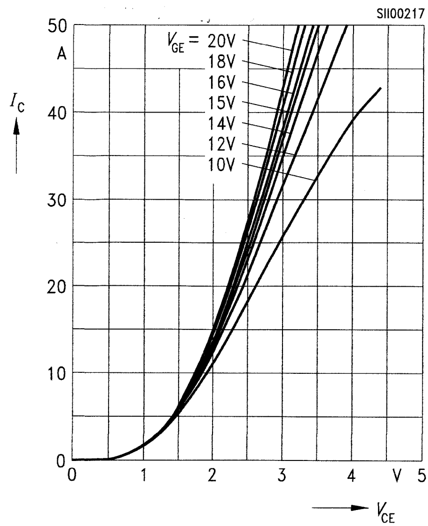
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



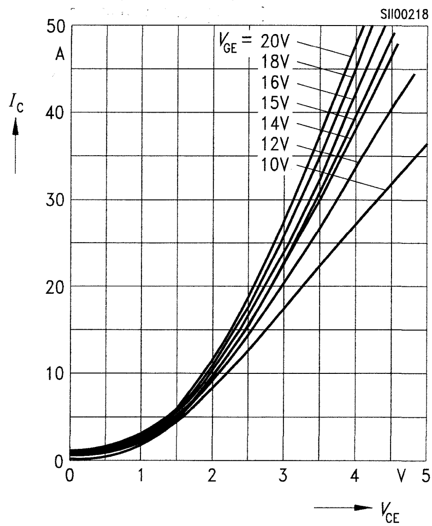
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



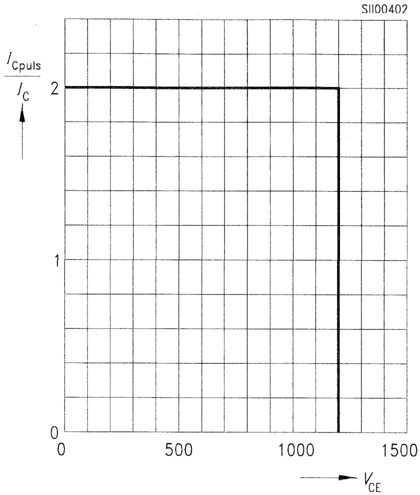
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



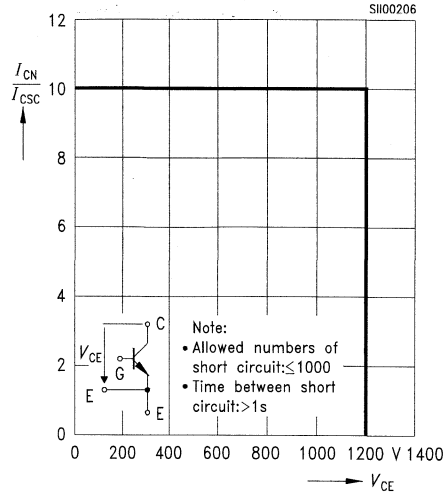
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



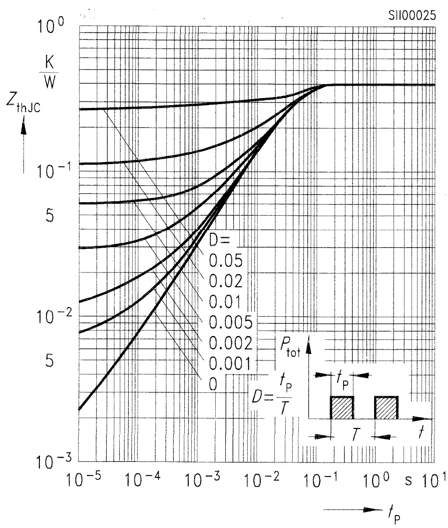
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



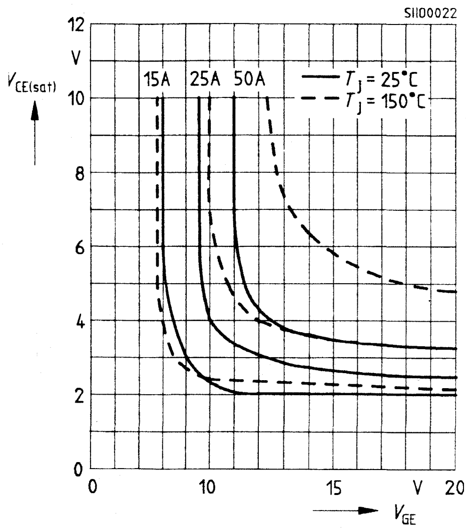
Safe operating area,
short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



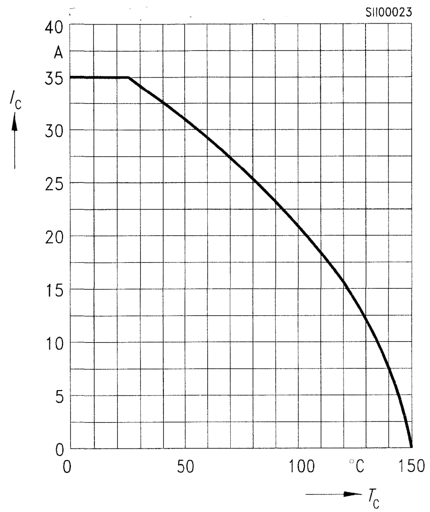
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



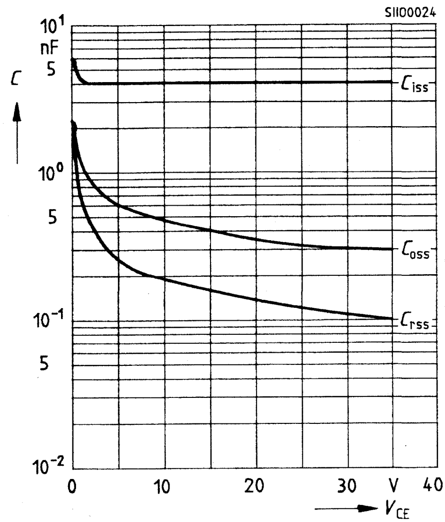
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



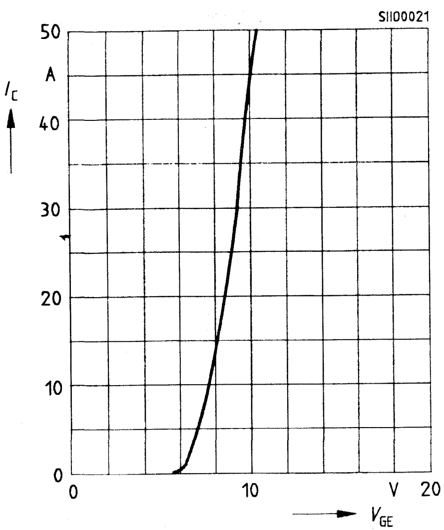
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



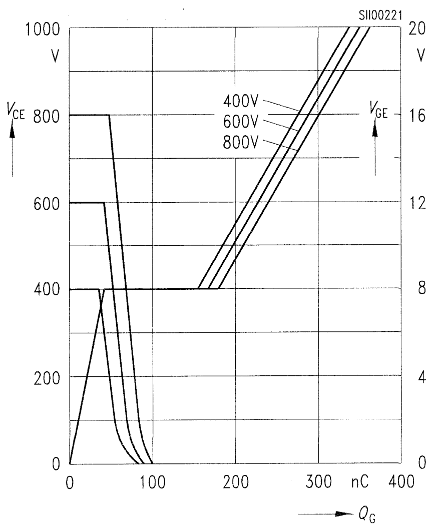
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



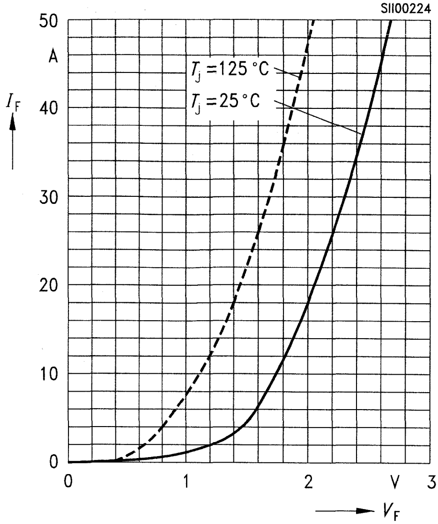
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



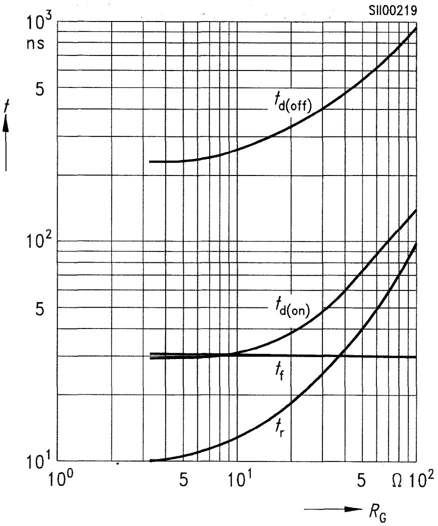
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



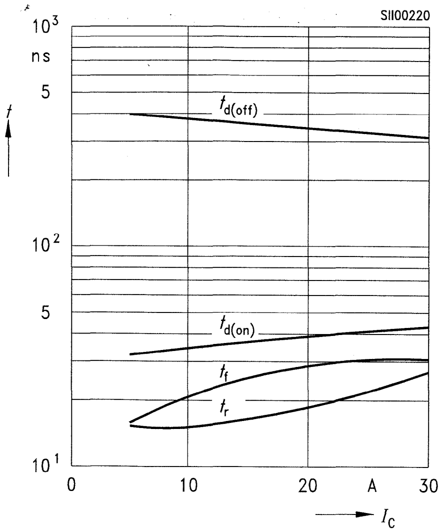
Forward characteristics of
fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 25 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



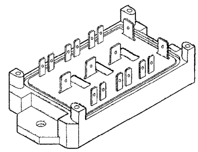
SIEMENS

IGBT Module
Preliminary Data

BSM 25 GD 100 D

V_{CE} = 1000 V
I_C = 6 x 35 A at T_C = 25 °C
I_C = 6 x 25 A at T_C = 80 °C

- Power module
- 3-phase full bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 3[1)]



Type	Ordering Code
BSM 25 GD 100 D	C67076-A2501-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	35 25	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	70 50	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	300	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.4	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 0.75 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 2 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 25 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 750 3000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 25 A	g_{fs}	9.0		–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	4000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	320	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	130	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

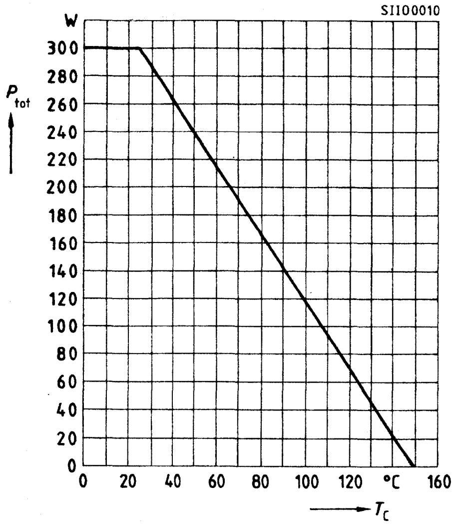
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	110	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	200	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	300	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	5	10	15	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	160	230	280	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	20	30	40	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	1.4 1.3	– –	mWs

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

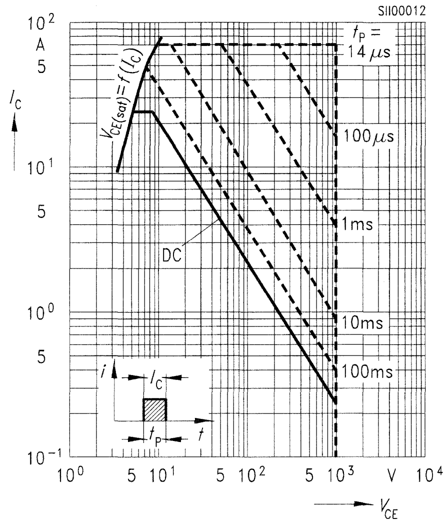
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 25 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 1.75 1.4	 – –	V
Reverse recovery time I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.13	 –	µs
Reverse recovery charge I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 2.3 6	 – –	µC
Soft factor I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	1.0	K/W

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

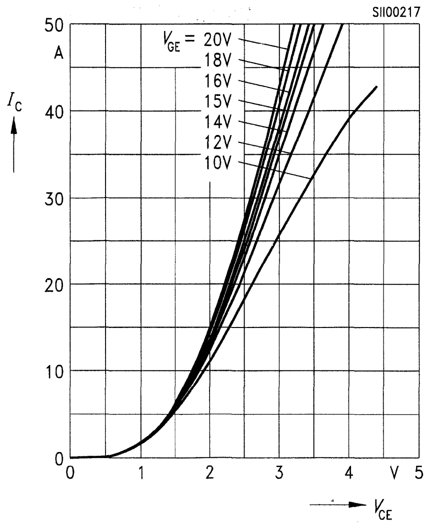
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



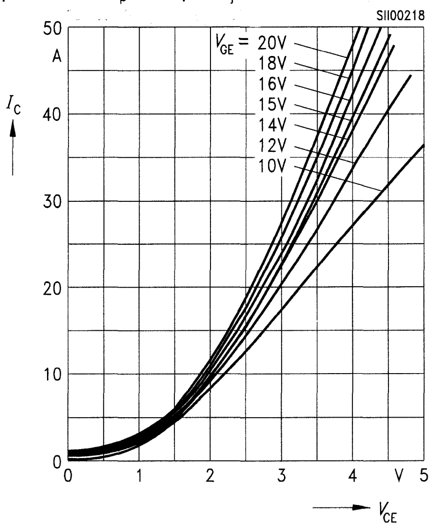
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \le$ 150 °C



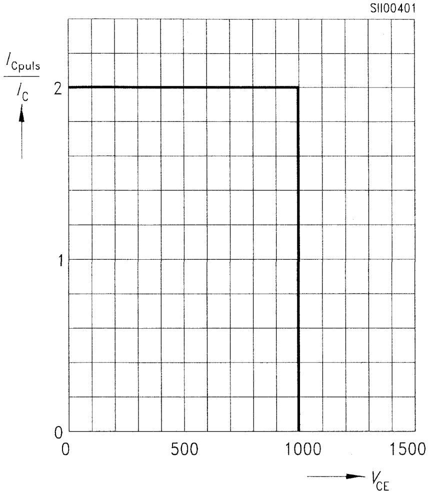
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \le$ 25 °C



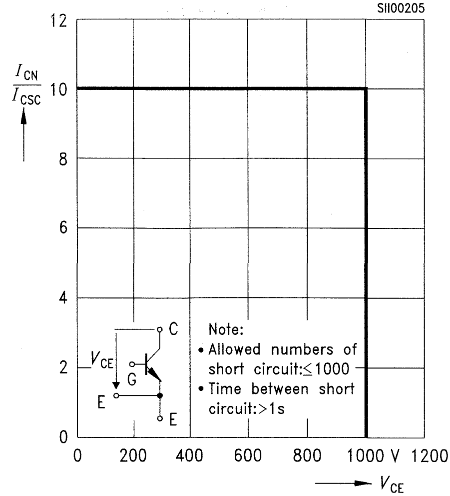
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \le$ 125 °C



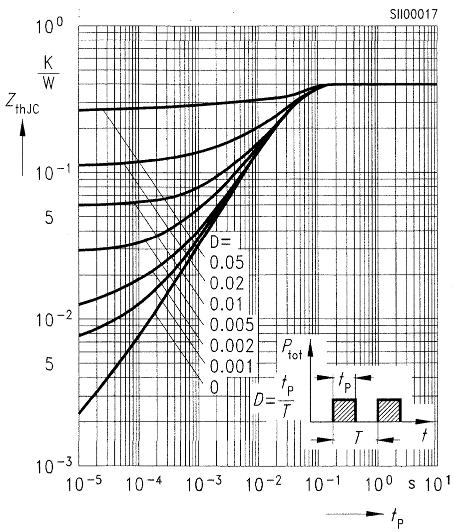
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



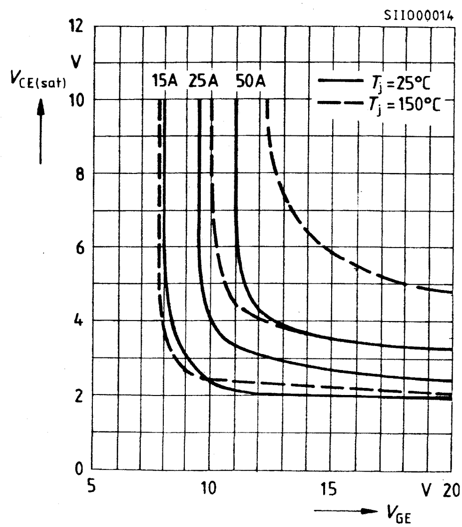
Safe operating area,
short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



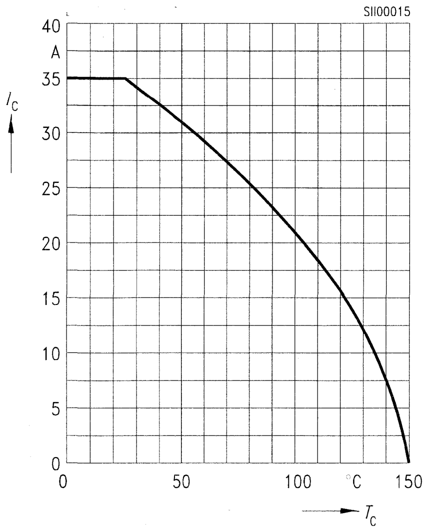
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



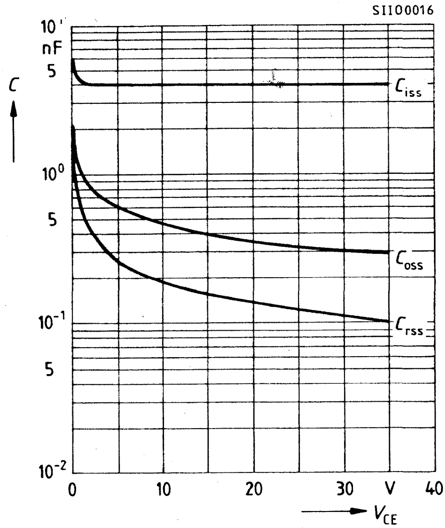
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



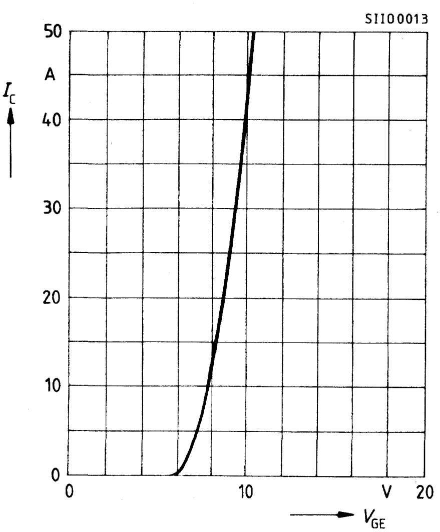
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



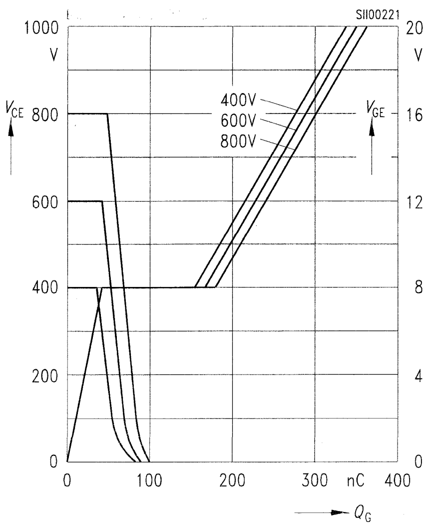
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



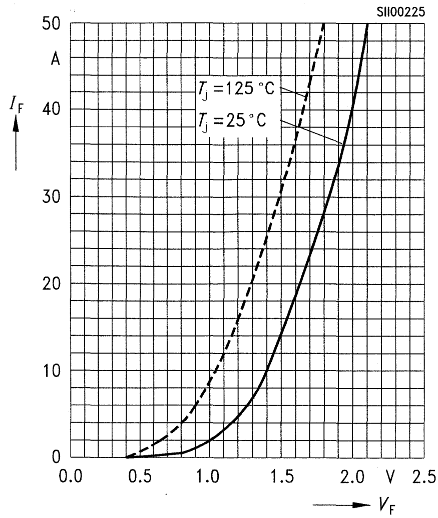
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



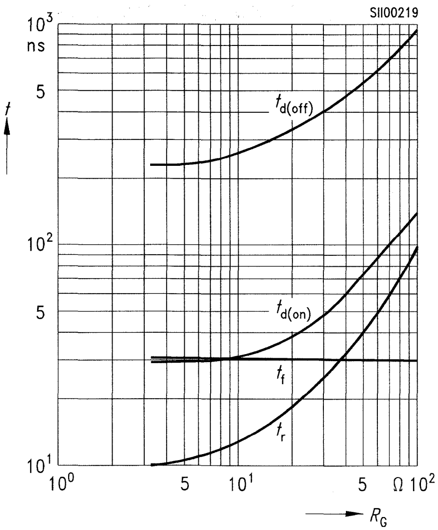
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



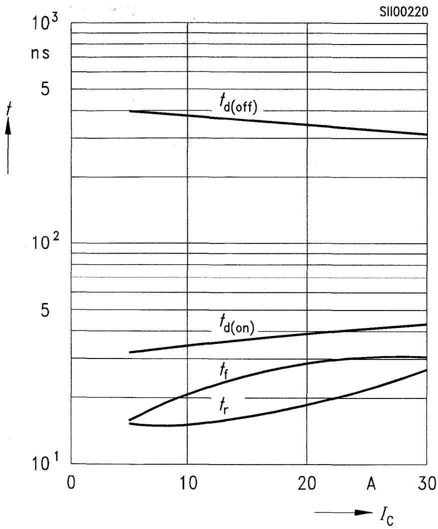
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 25 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



SIEMENS

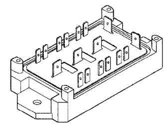
IGBT Module

BSM 25 GD 120 D

Preliminary Data

V_{CE} = 1200 V
I_C = 6 x 35 A at T_C = 25 °C
I_C = 6 x 25 A at T_C = 80 °C

- Power module
- 3-phase full bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 3[1)]



VM305171

Type	Ordering Code
BSM 25 GD 120 D	C67076-A2505-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	35 25	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	70 50	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	300	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.4	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 0.75 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 2 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 25 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 750 3000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 25 A	g_{fs}	9.0		–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	4000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	320	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	130	–	

Switching Characteristics
at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	110	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	200	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	300	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	5	10	15	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	160	230	280	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	20	30	40	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 25 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	1.4 1.3	– –	mWs

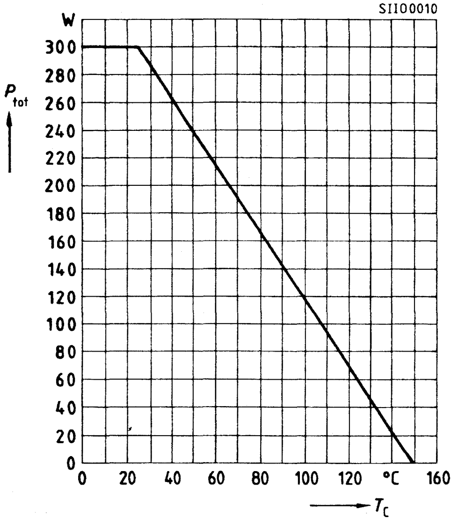
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

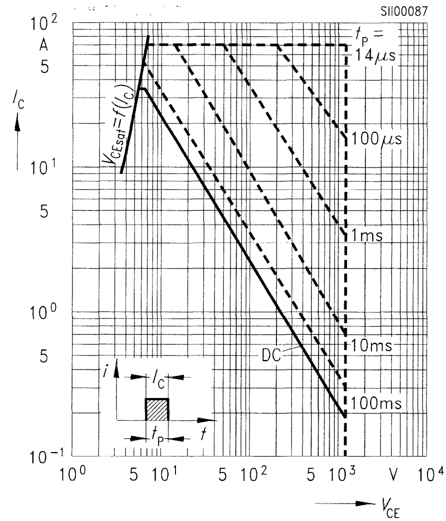
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 25 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.15 1.55	 – –	V
Reverse recovery time I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.13	 –	µs
Reverse recovery charge I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 2.3 6	 – –	µC
Soft factor I_F = 25 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	1.0	K/W

Characteristics at T_j = 25 ˚C, unless otherwise specified.

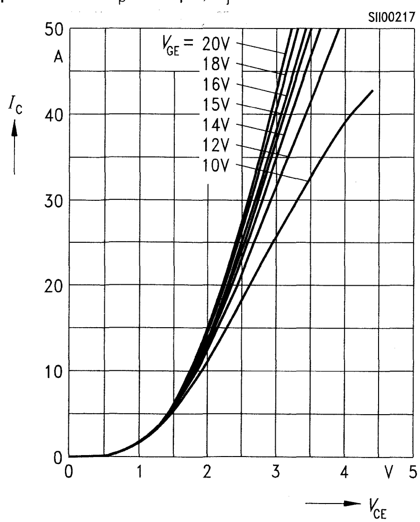
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 ˚C



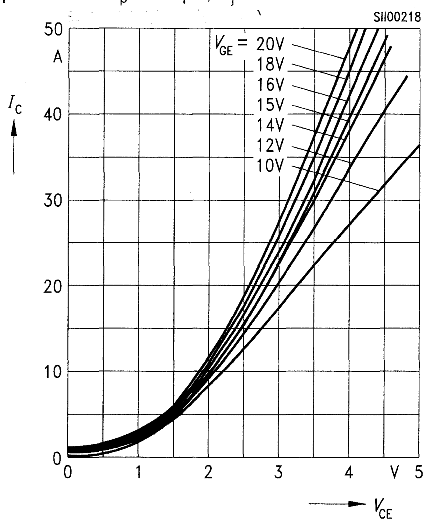
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 ˚C
$T_j \leq$ 150 ˚C



Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 ˚C

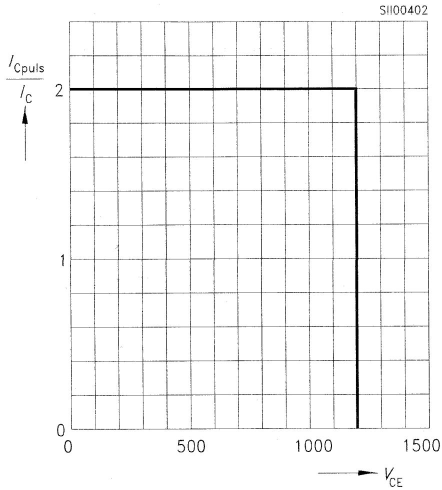


Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 ˚C



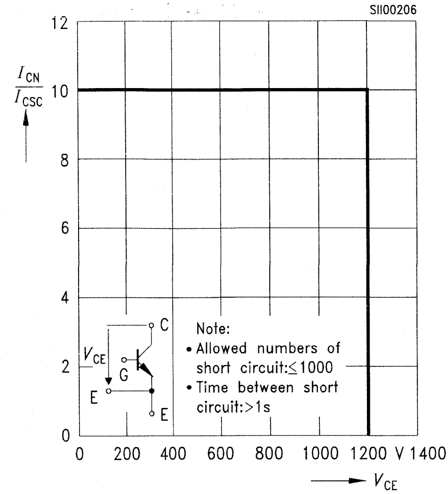
Reverse biased safe operating area

$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



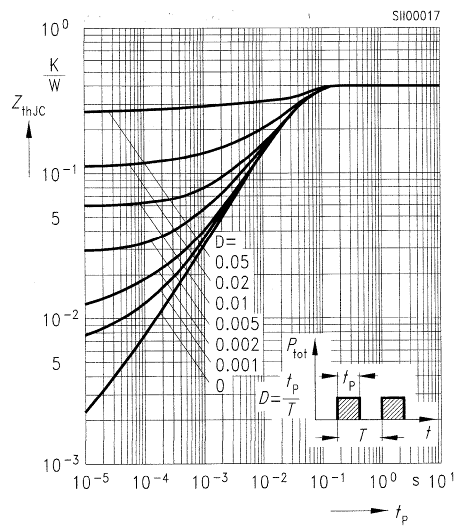
Safe operating area, short circuit

$I_C = f(V_{CE})$, $V_{GE} = \pm$ 15 V
$T_j \leq$ 150 °C, $t_{SC} \leq$ 10 µs, L < 50 nH



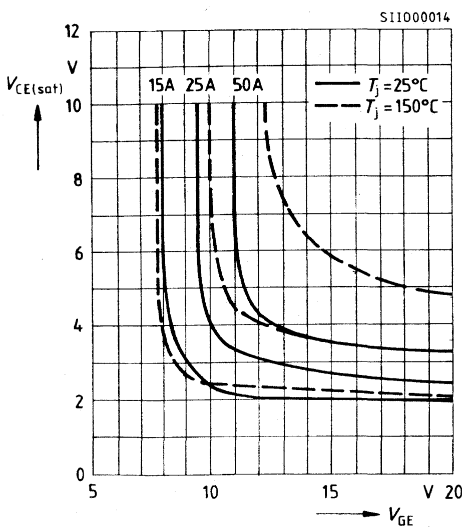
Transient thermal impedance

$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$

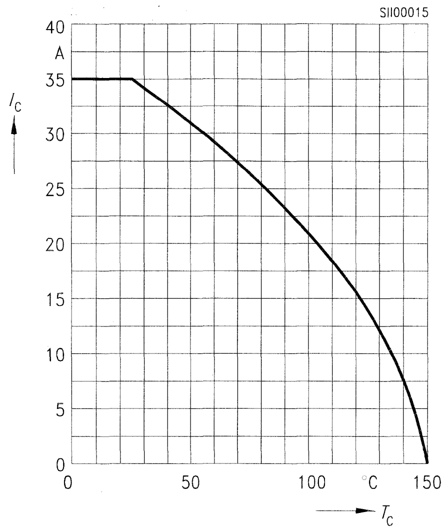


Typ. on-state characteristics

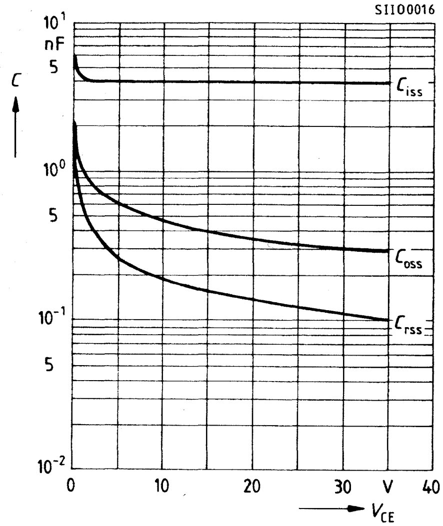
$V_{CE\,(sat)} = f(V_{GE})$, parameter: I_C, T_j



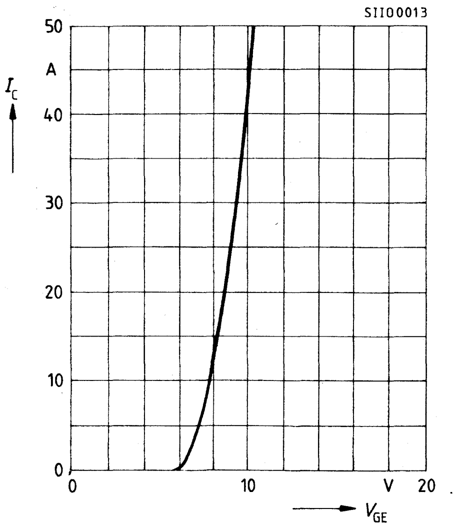
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



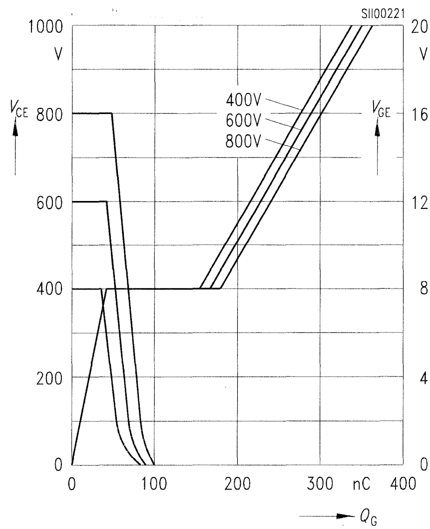
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



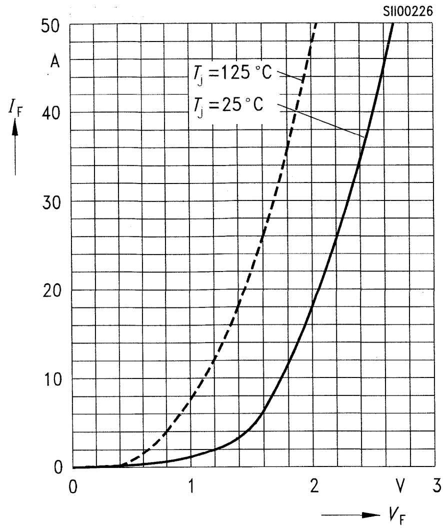
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



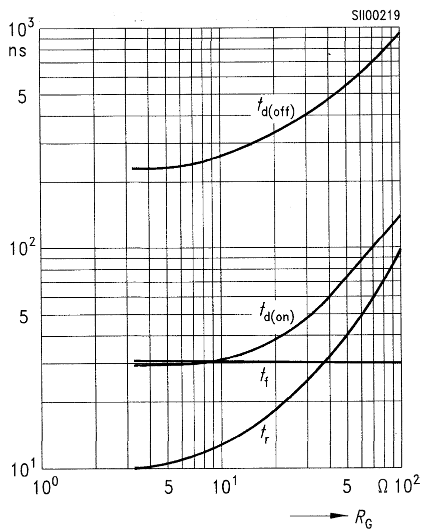
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



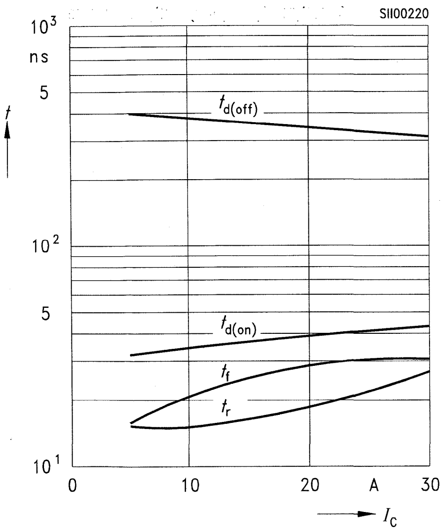
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 25 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω

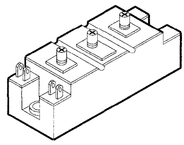


SIEMENS

IGBT Module **BSM 50 GB 100 D**
Preliminary Data **BSM 50 GAL 100 D**

V_{CE} = 1000 V
I_C = 2 x 70 A at T_C = 25 °C
I_C = 2 x 50 A at T_C = 80 °C

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 2b, 2c[1)]


VM205170

Half-bridge		Chopper	
Type	**Ordering Code**	**Type**	**Ordering code**
BSM 50 GB 100 D	C67076-A2100-A2	BSM 50 GAL 100 D	C67076-A2002-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	70 50	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	140 100	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	500	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.25	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 1 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 4 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 50 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 1000 4000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 50 A	g_{fs}	18	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	8000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	640	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	250	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

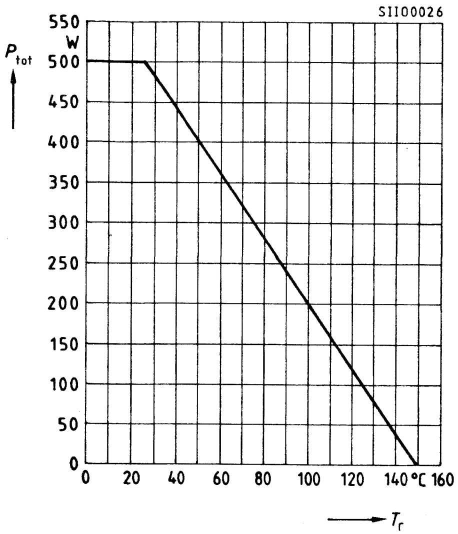
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	140	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	300	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	300	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	10	20	25	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	220	300	360	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	25	35	45	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	2.0 2.0	– –	mWs

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

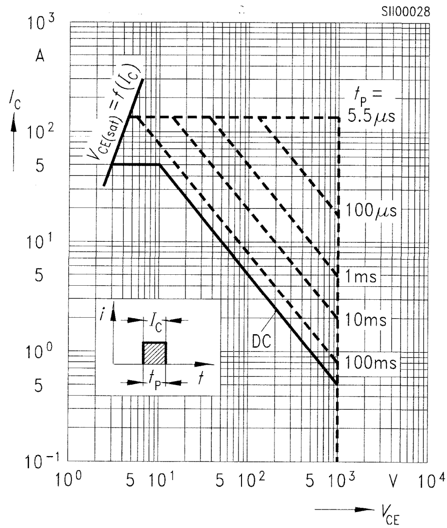
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 50 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 1.85 1.45	 – –	V
Reverse recovery time I_F = 50 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.2	 –	µs
Reverse recovery charge I_F = 50 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 3.6 10	 – –	µC
Soft factor I_F = 50 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.9	K/W

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

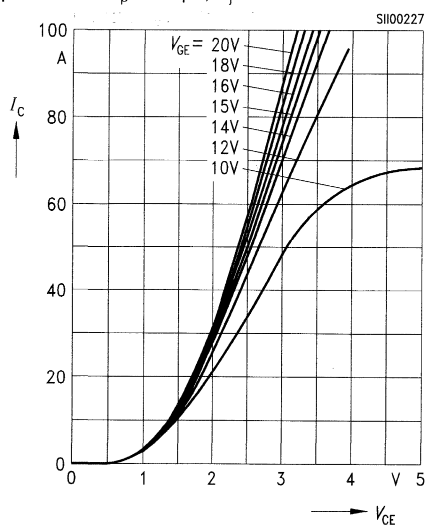
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



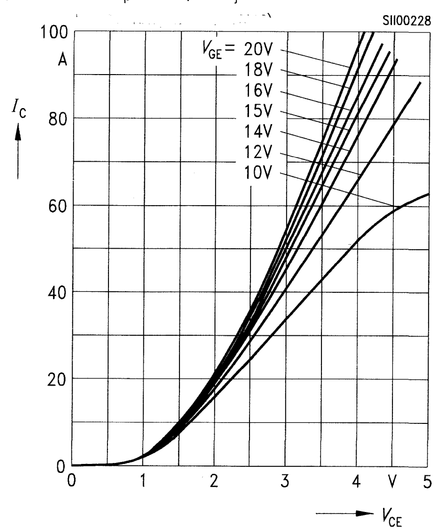
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



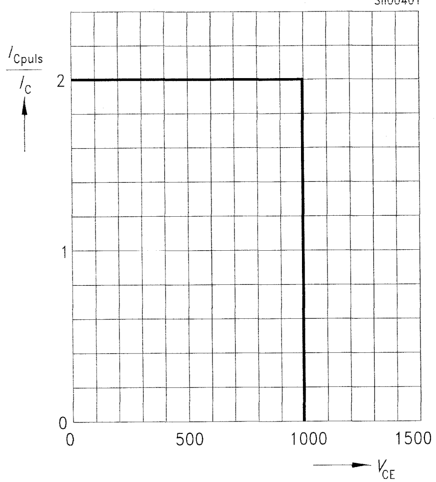
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 μs, $T_j \leq$ 25 °C



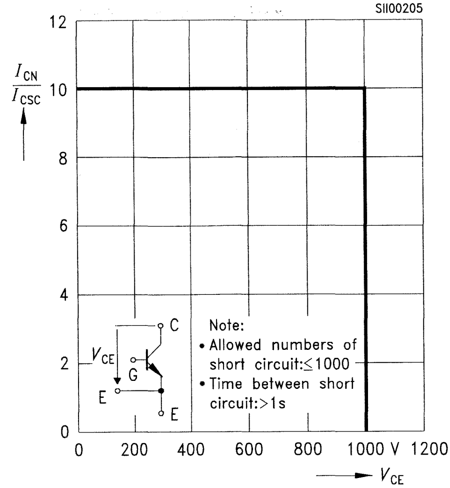
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 μs, $T_j \leq$ 125 °C



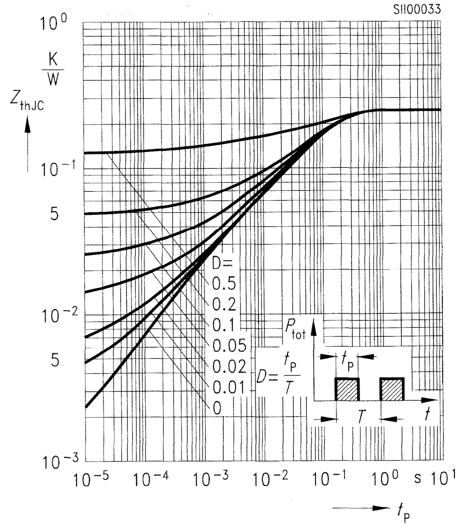
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



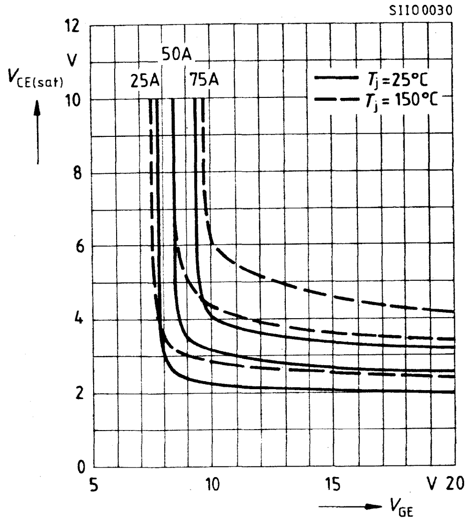
Safe operating area,
short circuit $I_C = f(V_{CE})$, $V_{GE} = \pm 15$ V
$T_j \leq 150$ °C, $t_{SC} \leq 10$ µs, $L < 50$ nH



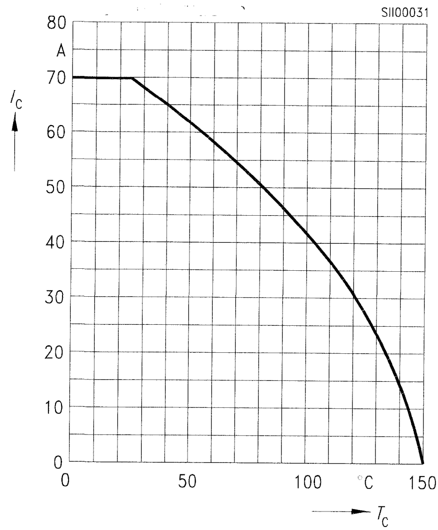
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



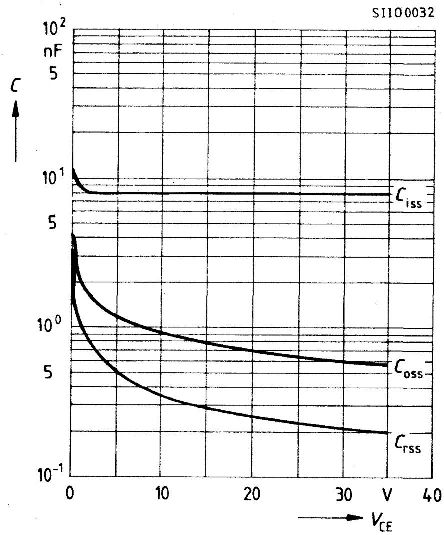
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



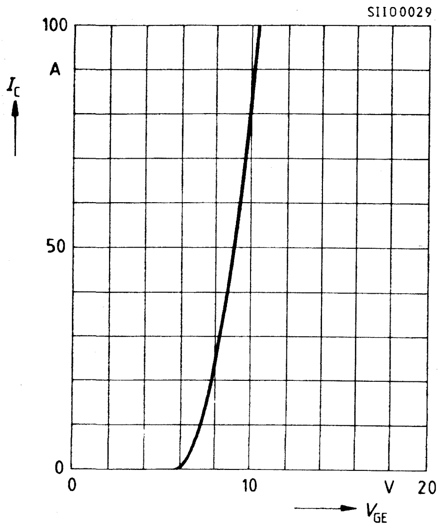
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



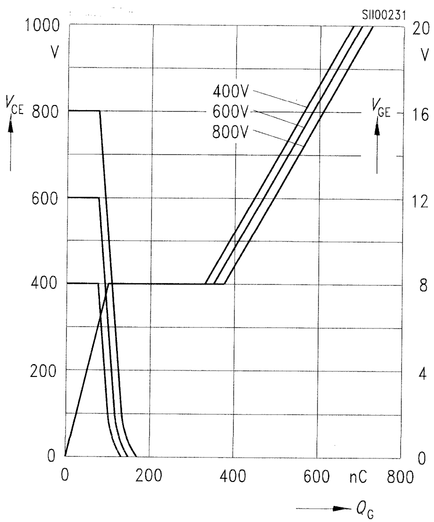
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0, f = 1$ MHz



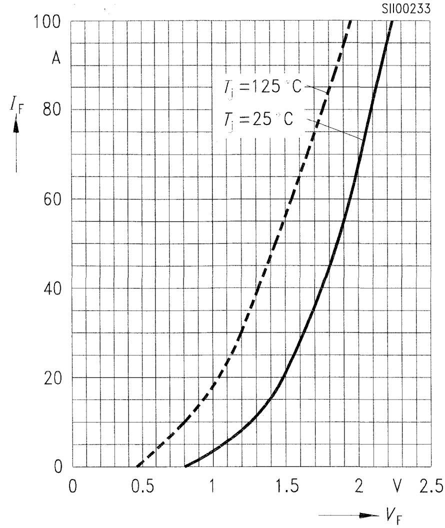
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



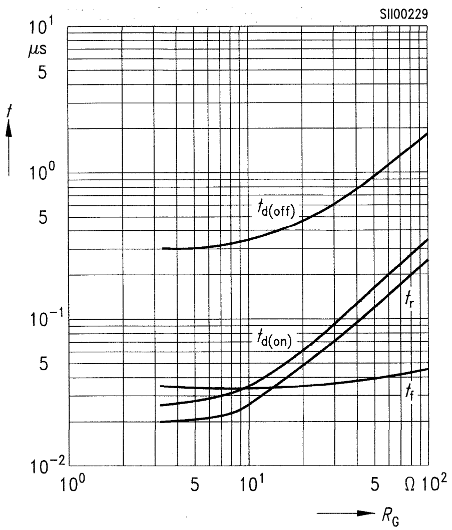
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



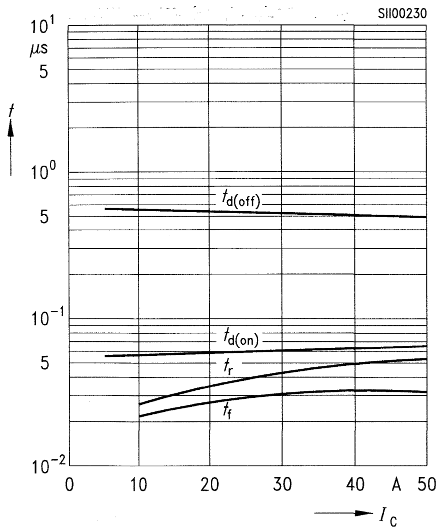
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 50 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



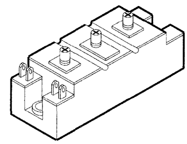
SIEMENS

IGBT Module
Preliminary Data

BSM 50 GB 120 D
BSM 50 GAL 120 D

V_{CE} = 1200 V
I_C = 2 x 70 A at T_C = 25 °C
I_C = 2 x 50 A at T_C = 80 °C

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 2b, 2c[1)]


VM205170

Half-bridge		**Chopper**	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 50 GB 120 D	C67076-A2105-A2	BSM 50 GAL 120 D	C67076-A2010-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	70 50	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	140 100	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	500	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.25	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 1 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 4 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 50 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 1000 4000	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 50 A	g_{fs}	18	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	8000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	640	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	250	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

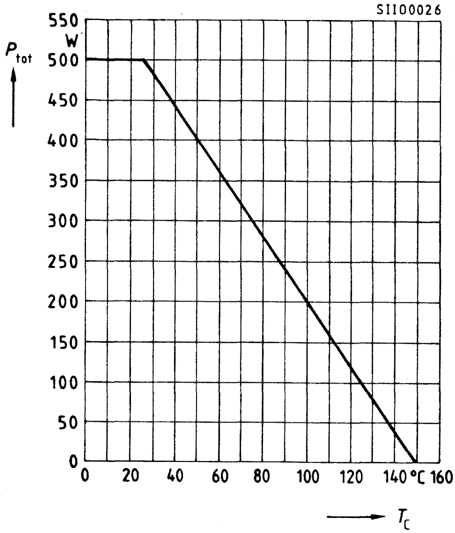
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	140	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	300	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	300	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	10	20	25	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	220	300	360	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	25	35	45	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	2.0 2.0	– –	mWs

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

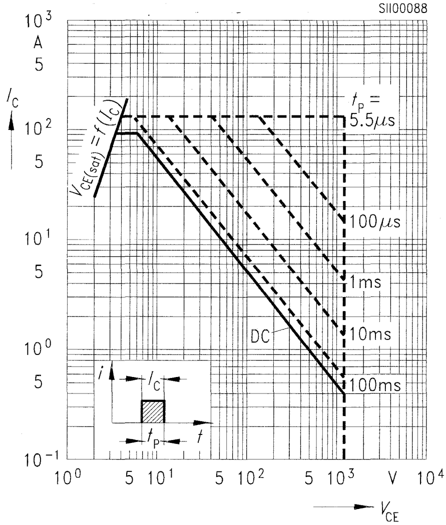
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 50 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.45 1.9	 – –	V
Reverse recovery time I_F = 50 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.2	 –	µs
Reverse recovery charge I_F = 50 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 3.6 10	 – –	µC
Soft factor I_F = 50 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.9	K/W

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

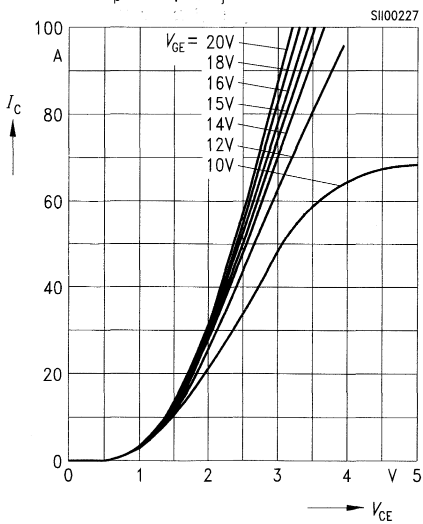
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



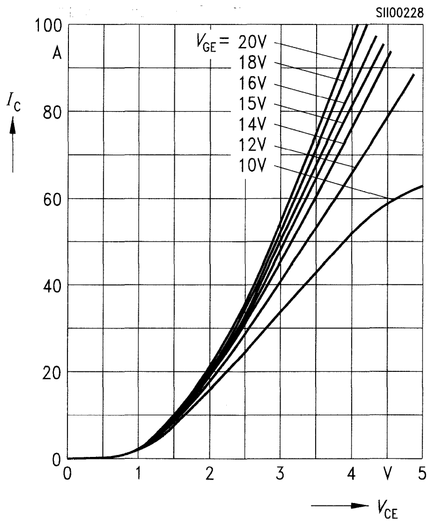
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



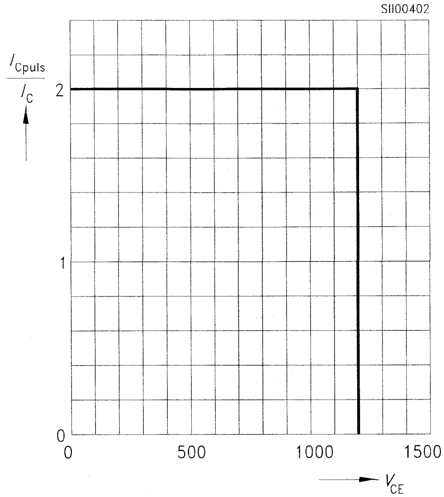
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



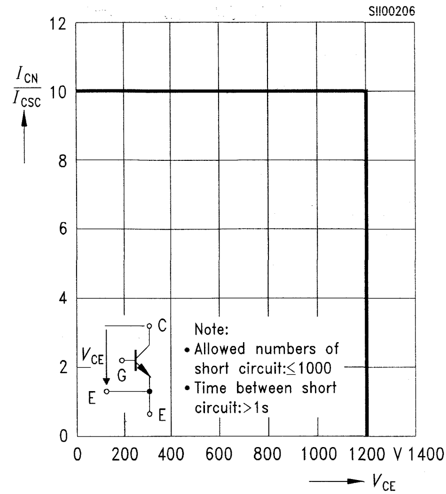
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



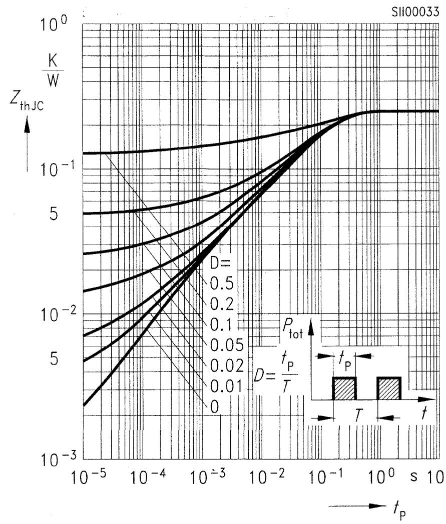
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



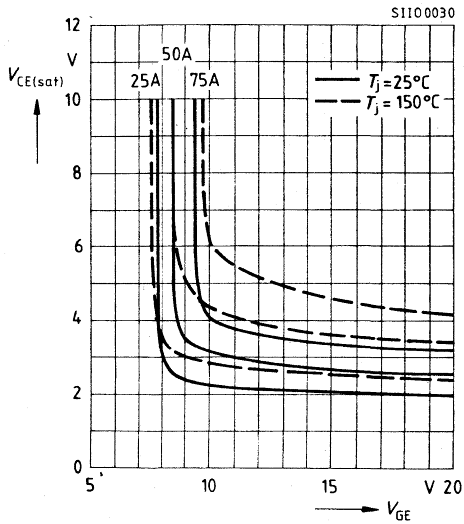
Safe operating area,
short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



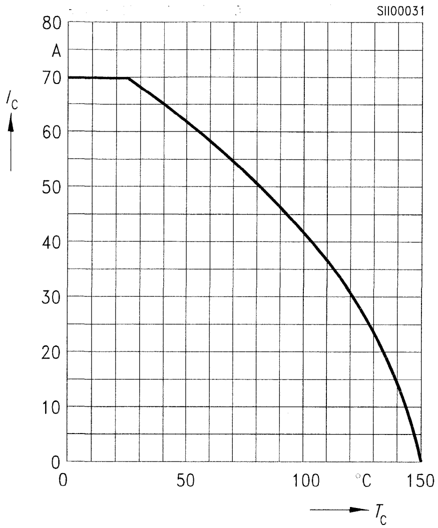
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



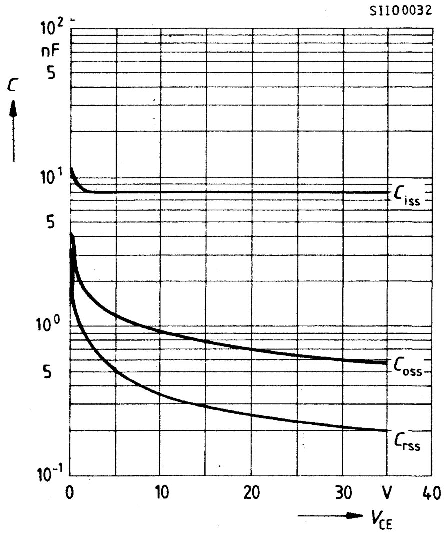
Typ. on-state characteristics
$V_{CE\,(sat)} = f(V_{GE})$, parameter: I_C, T_j



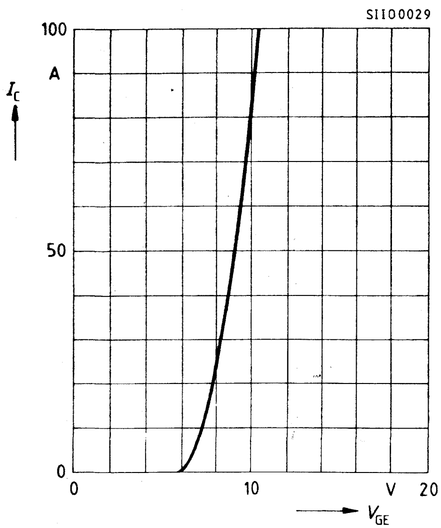
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



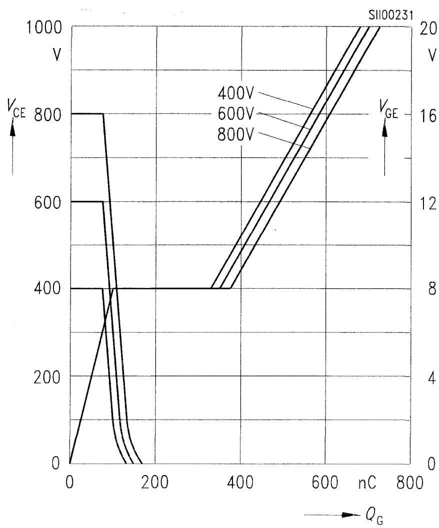
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0, f = 1$ MHz



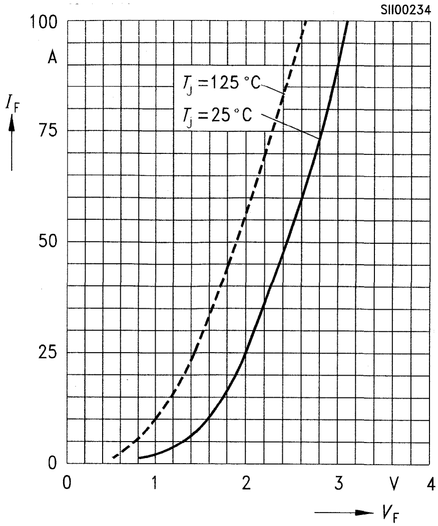
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



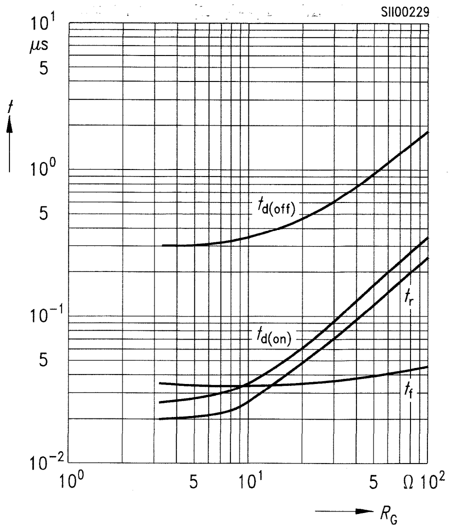
Typ. gate charge $V_{CE}, V_{GE} = f(Q_G)$



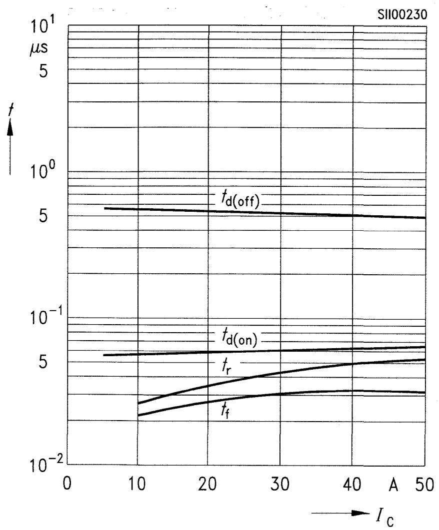
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 50 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



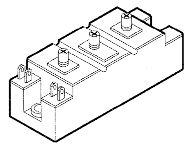
SIEMENS

IGBT Module
Preliminary Data

BSM 75 GB 100 D
BSM 75 GAL 100 D

V_{CE} = 1000 V
I_C = 2 x 100 A at T_C = 25 °C
I_C = 2 x 75 A at T_C = 80 °C

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 2b, 2c[1)]


VM205170

Half-bridge		**Chopper**	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 75 GB 100 D	C67076-A2104-A2	BSM 75 GAL 100 D	C67076-A2003-A2

Maximum Ratings

Parameter	**Symbol**	**Values**	**Unit**
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	100 75	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	200 150	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	625	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.2	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE}= 0, I_C = 1.4 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE}= V_{CE}, I_C = 5 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 75 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 1400 –	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 75 A	g_{fs}	27	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	11000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	850	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	350	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	240	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	350	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	10	20	25	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	250	350	420	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	30	40	50	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	7.5 3.5	– –	mWs

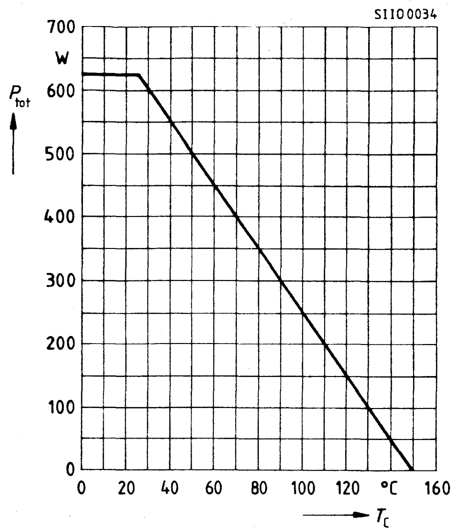
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

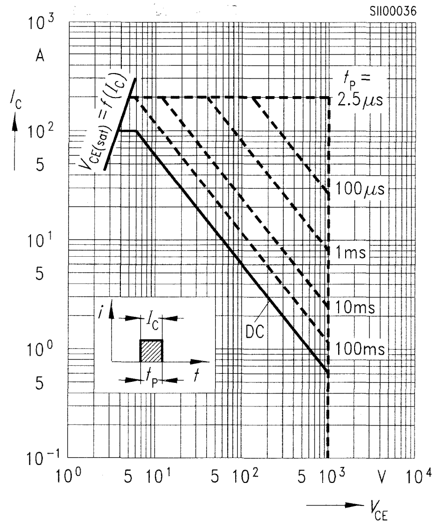
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 75 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.0 1.6	 – –	V
Reverse recovery time I_F = 75 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.25	 –	µs
Reverse recovery charge I_F = 75 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 4 13.5	 – –	µC
Soft factor I_F = 75 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.75	K/W

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

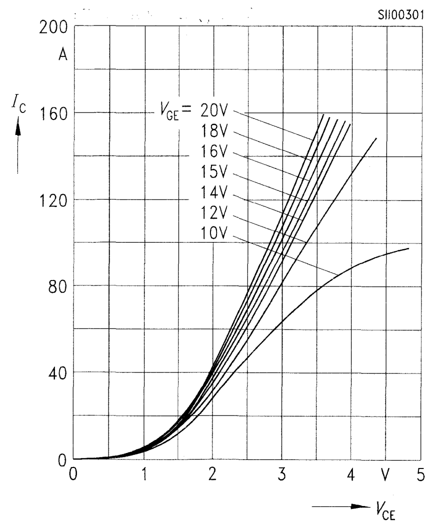
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



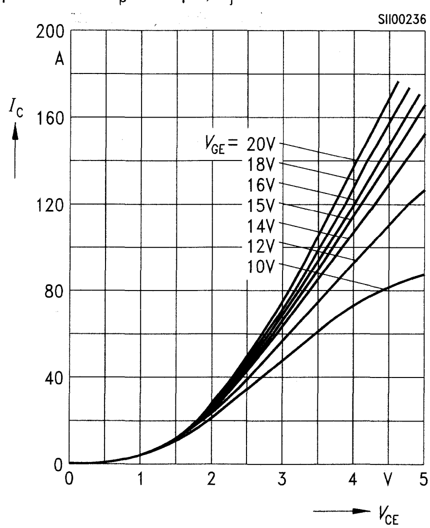
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



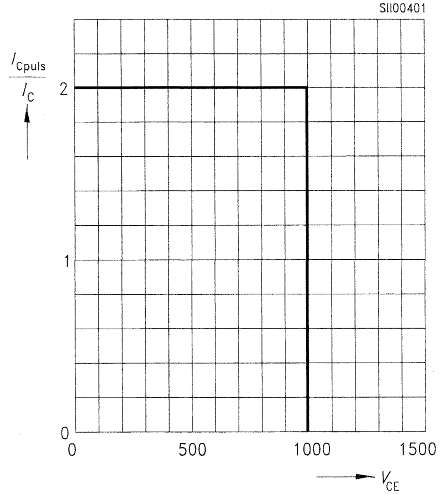
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



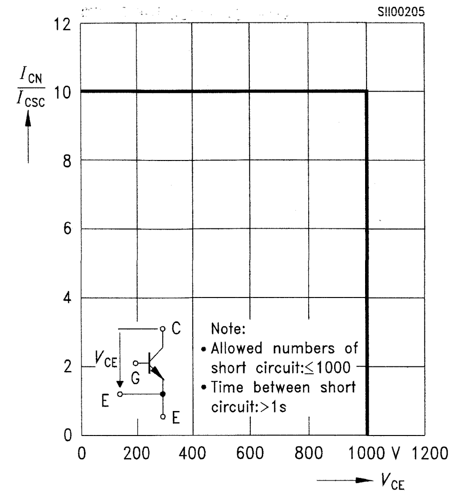
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



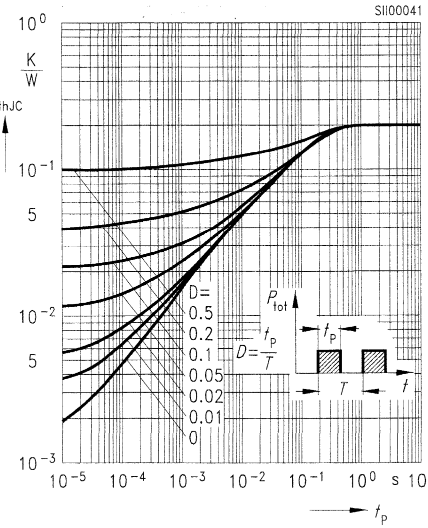
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



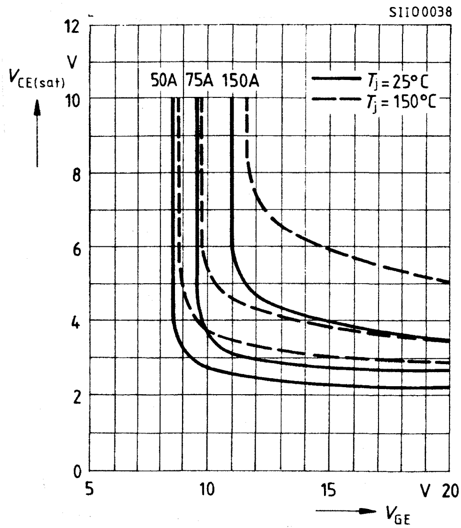
Safe operating area, short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



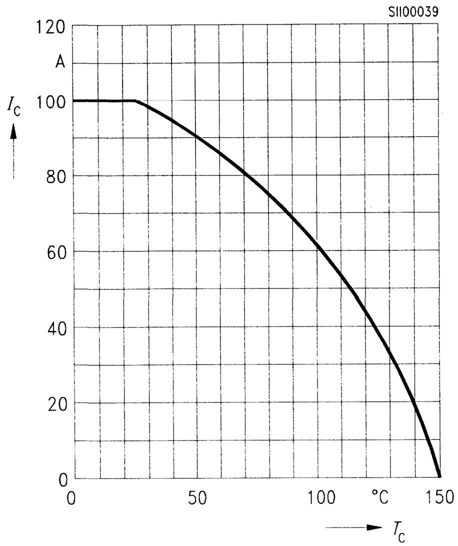
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



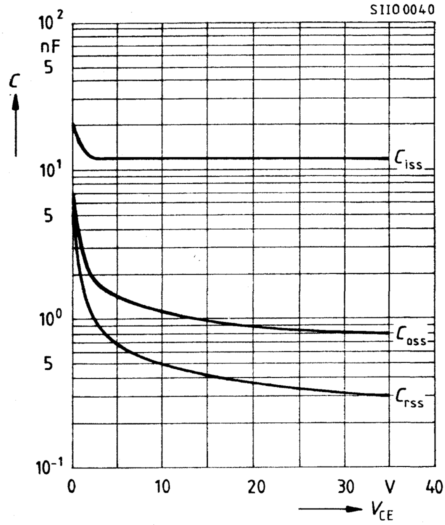
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



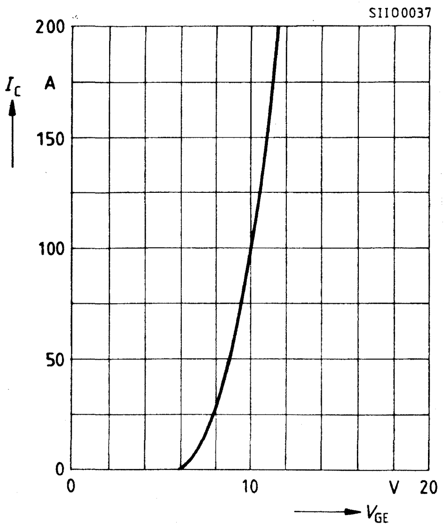
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



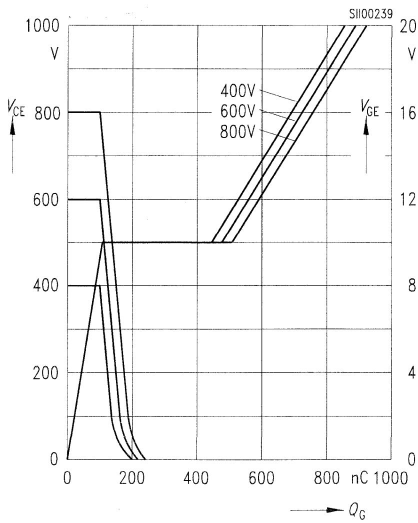
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



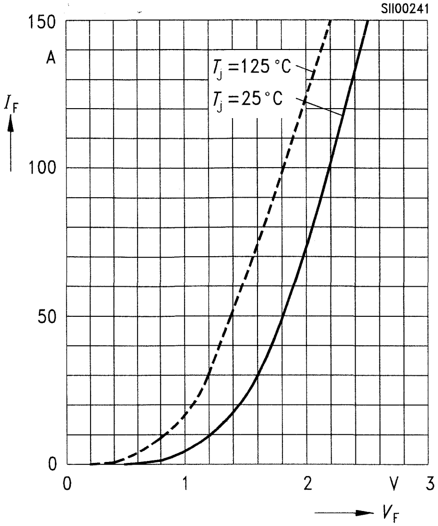
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



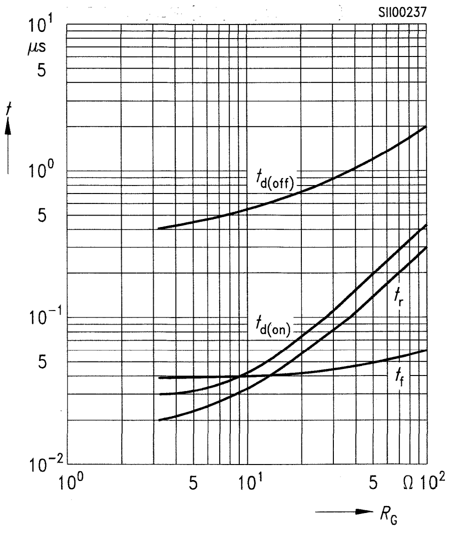
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



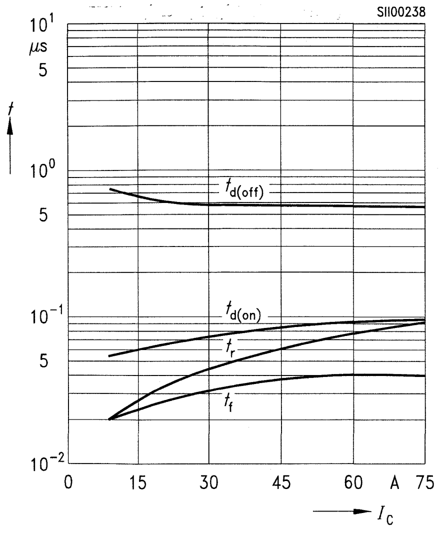
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 75 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



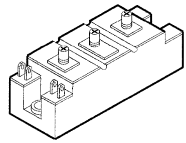
SIEMENS

IGBT Module
Preliminary Data

BSM 75 GB 120 D
BSM 75 GAL 120 D

V_{CE} = 1200 V
I_C = 2 x 100 A at T_C = 25 °C
I_C = 2 x 75 A at T_C = 80 °C

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 2b, 2c[1)]



Half-bridge		**Chopper**	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 75 GB 120 D	C67076-A2106-A2	BSM 75 GAL 120 D	C67076-A2011-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	100 75	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	200 150	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	625	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.2	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 1.4 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 5 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 75 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 1400 –	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 75 A	g_{fs}	27	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	11000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	850	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	350	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

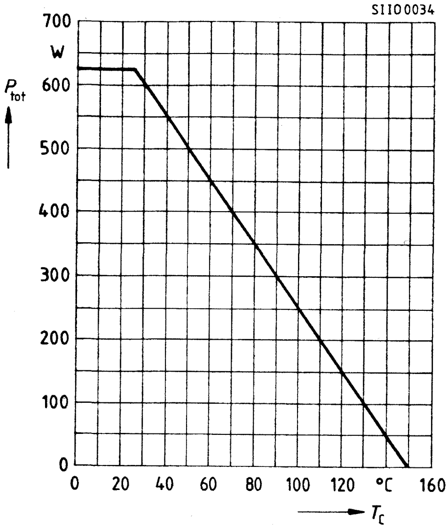
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	240	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	350	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	20	30	40	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	10	20	25	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	250	350	420	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	30	40	50	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 75 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	7.5 3.5	– –	mWs

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

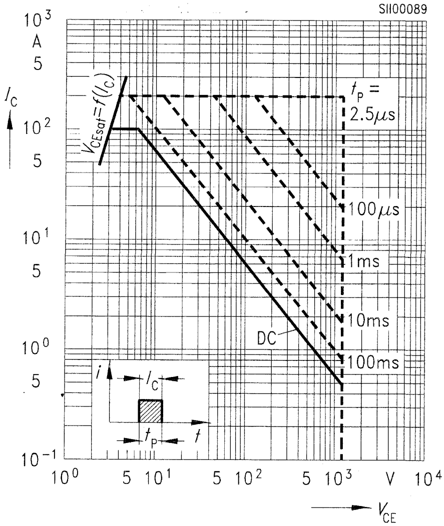
Parameter	Symbol	Values min.	Values typ.	Values max.	Unit
Free-Wheel Diode					
Diode forward voltage I_F = 75 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.55 2.15	 – –	V
Reverse recovery time I_F = 75 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.25	 –	µs
Reverse recovery charge I_F = 75 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 4 13.5	 – –	µC
Soft factor I_F = 75 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.75	K/W

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

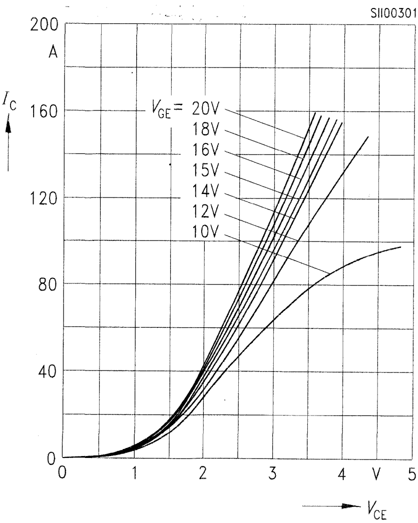
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



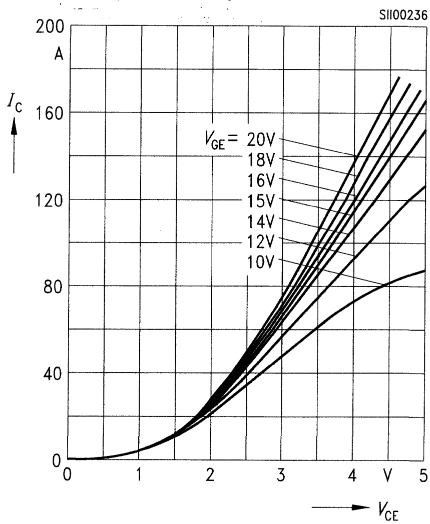
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



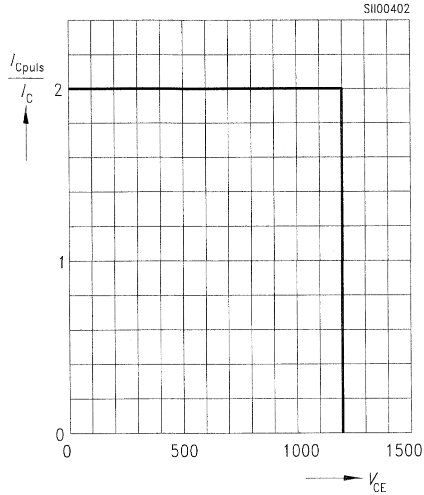
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



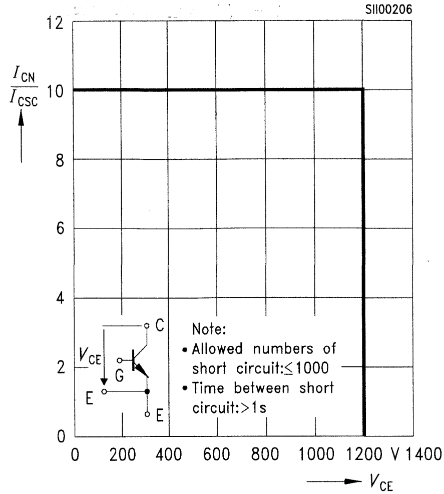
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



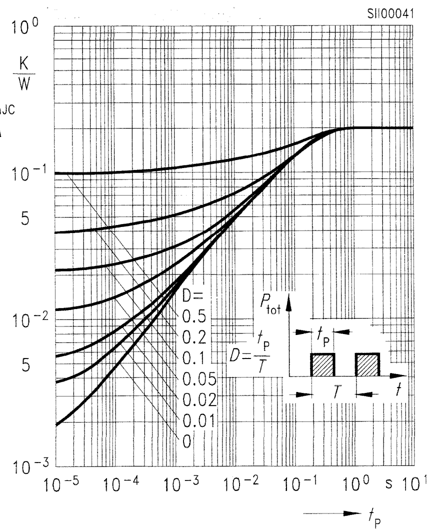
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



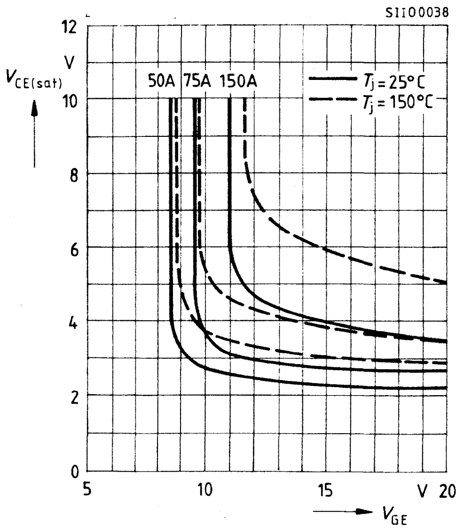
Safe operating area,
short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



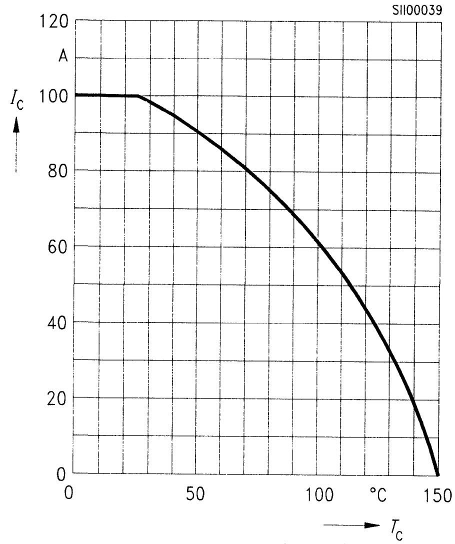
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



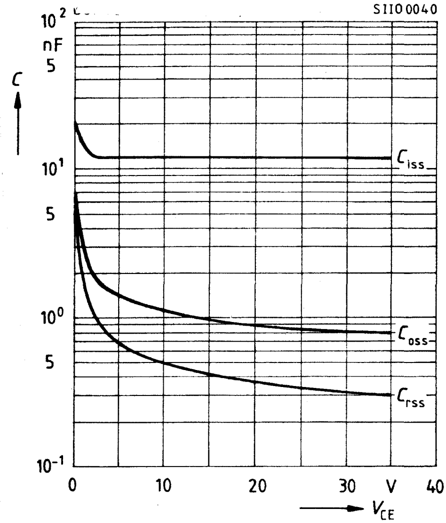
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



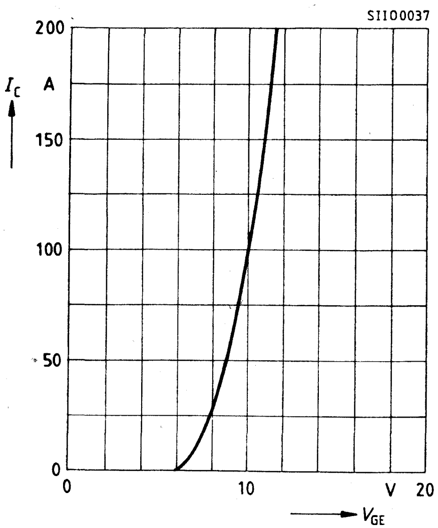
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



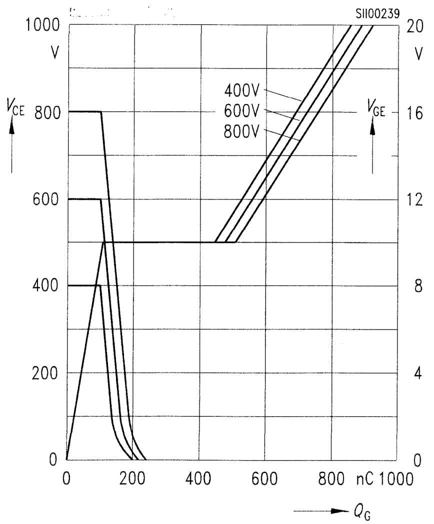
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



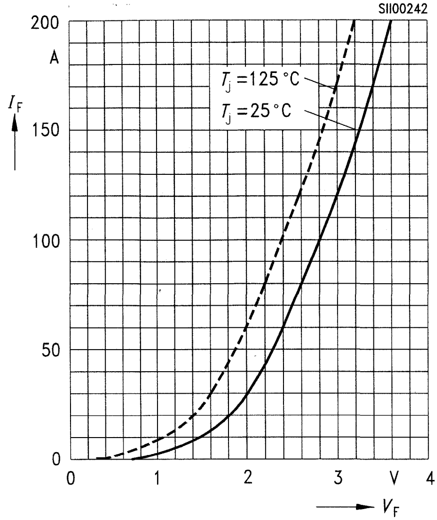
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



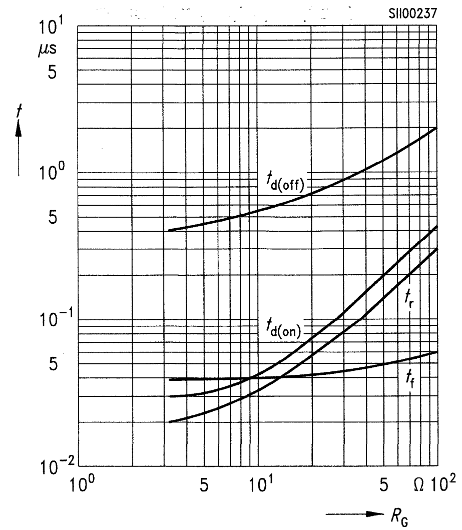
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



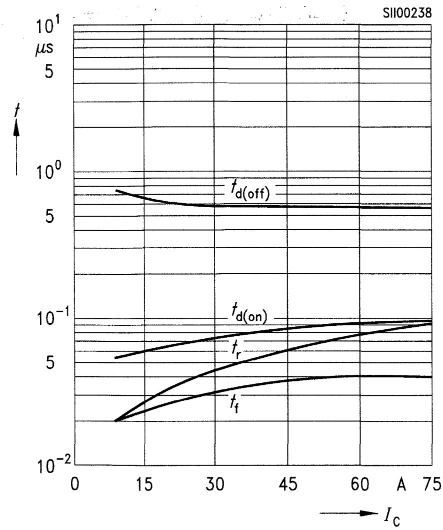
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 75 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



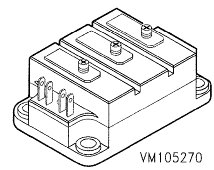
SIEMENS

IGBT Module
Preliminary Data

BSM 100 GB 100 D
BSM 100 GAL 100 D

V_{CE} = 1000 V
I_C = 2 x 135 A at T_C = 25 °C
I_C = 2 x 100 A at T_C = 80 °C

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 5a, 5b[1)]



Half-bridge		**Chopper**	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 100 GB 100 D	C67076-A2103-A2	BSM 100 GAL 100 D	C67076-A2004-A2

Maximum Ratings

Parameter	**Symbol**	**Values**	**Unit**
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	135 100	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	270 200	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	1000	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.13	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 2 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 8 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 100 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 2000 –	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 100 A	g_{fs}	36	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	16000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	1300	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	500	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

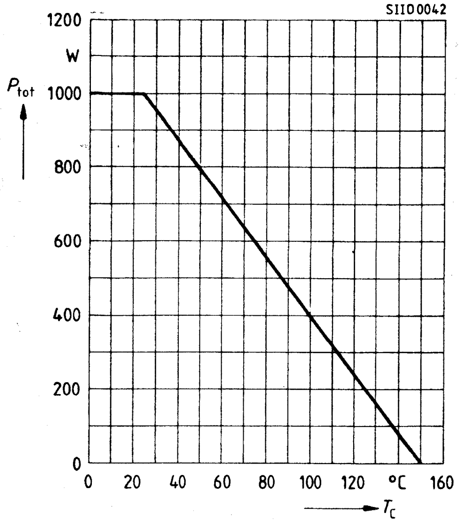
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	100	180	220	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	450	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	550	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	100	180	220	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	25	55	85	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	410	550	660	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	60	85	110	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	6 5	– –	mWs

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

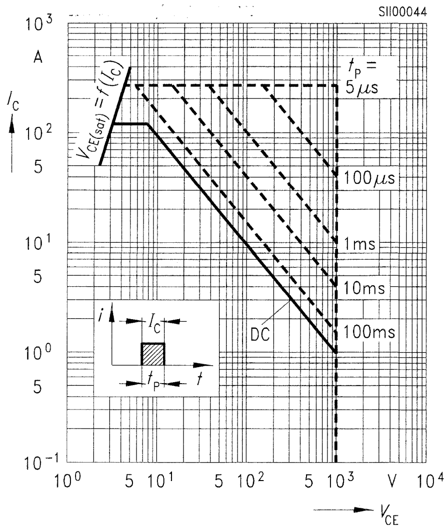
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 100 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 1.85 1.45	 – –	V
Reverse recovery time I_F = 100 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 125 °C	t_{rr}	 –	 0.3	 –	µs
Reverse recovery charge I_F = 100 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 6 18	 – –	µC
Soft factor I_F = 100 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.5	K/W

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

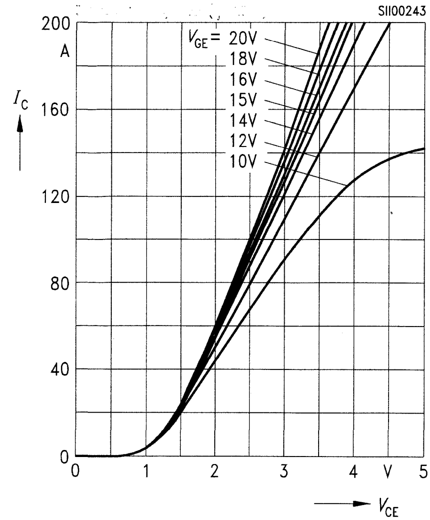
Power dissipation $P_{tot} = f\,(T_C)$
parameter: T_j = 150 °C



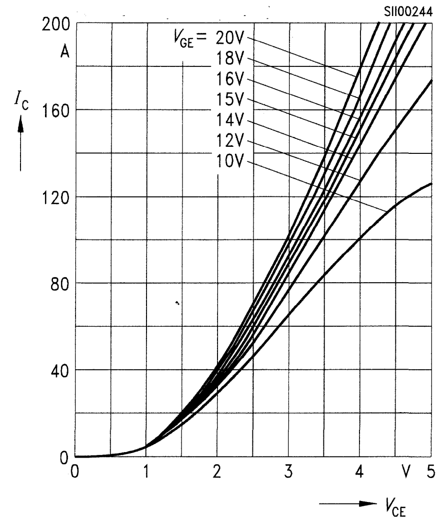
Safe operating area $I_C = f\,(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



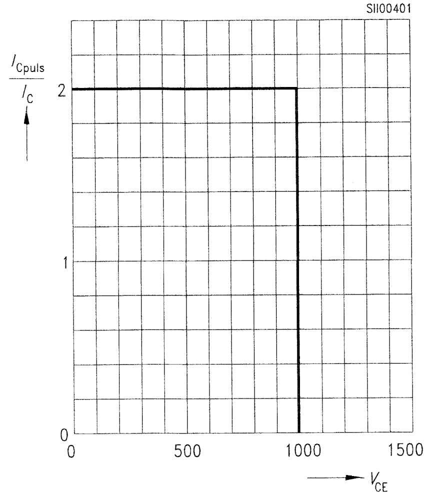
Typ. output characteristics $I_C = f\,(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



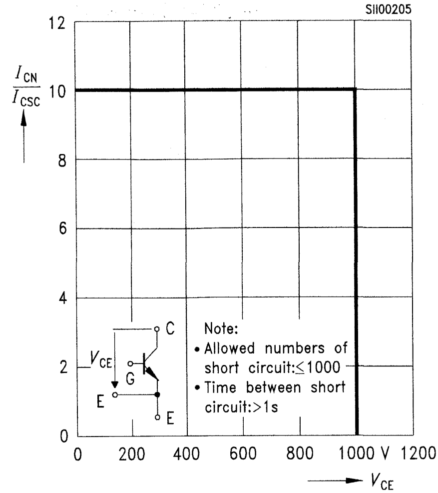
Typ. output characteristics $I_C = f\,(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



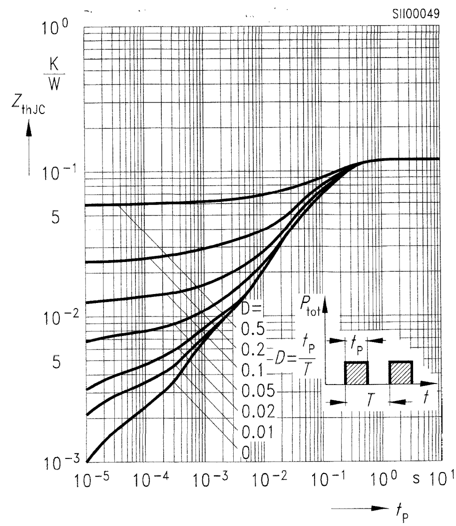
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



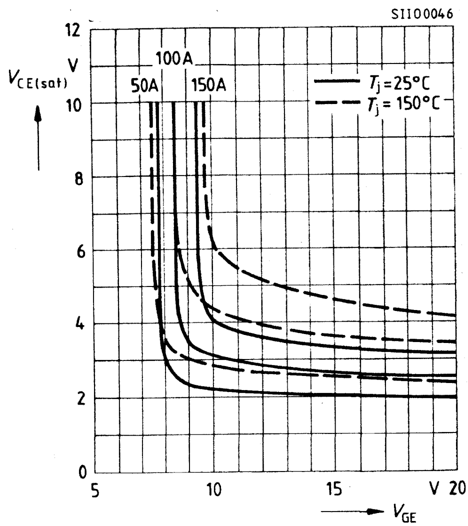
Safe operating area,
short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



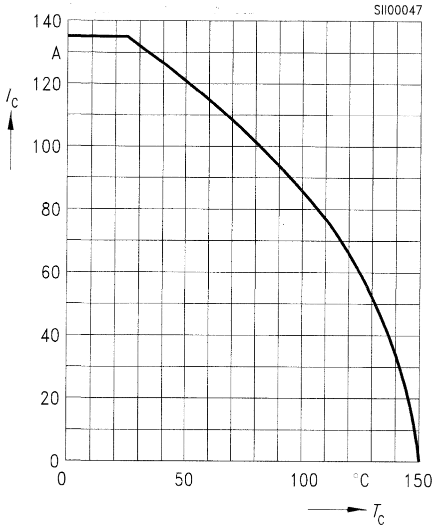
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



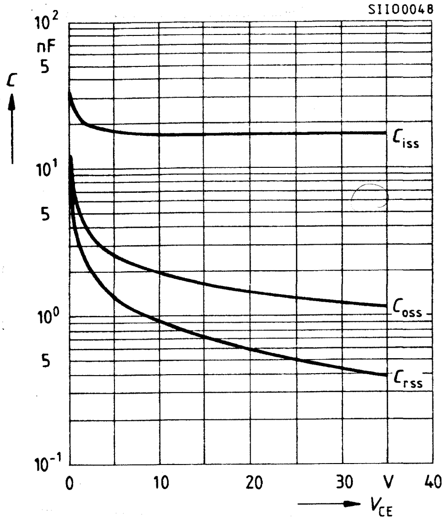
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



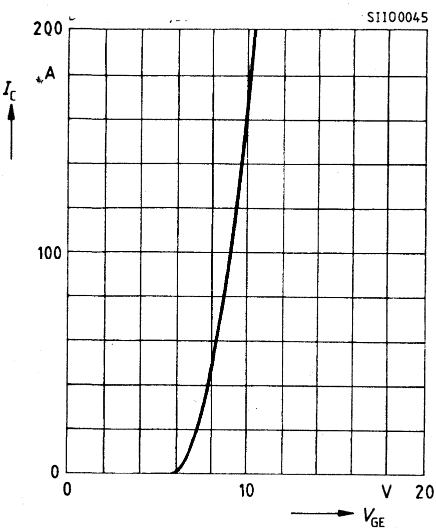
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



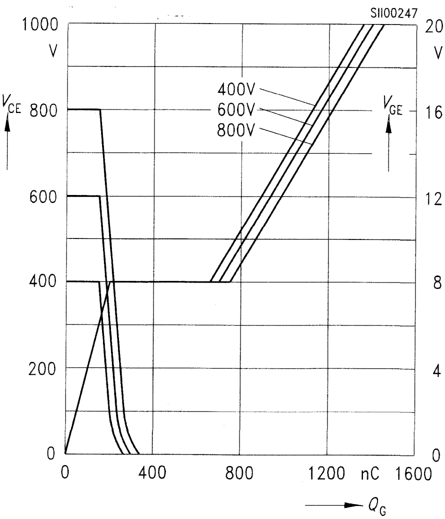
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



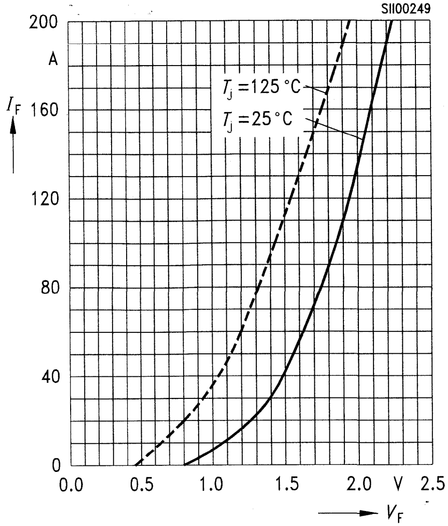
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



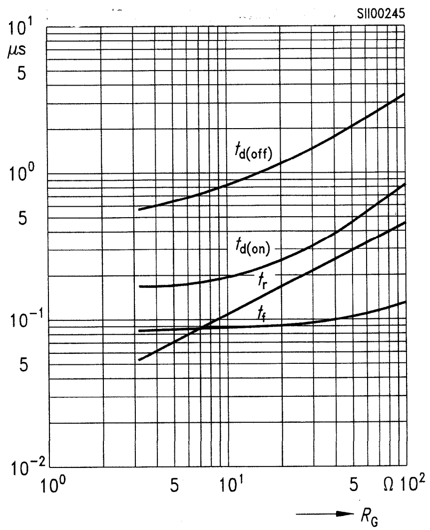
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



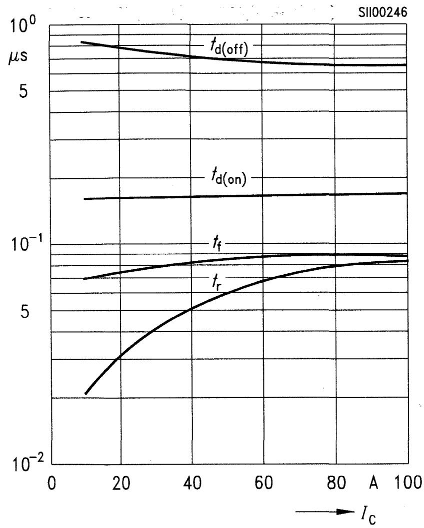
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 200 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 5.6 Ω



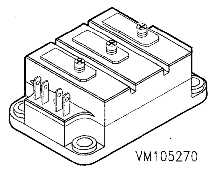
SIEMENS

IGBT Module
Preliminary Data

BSM 100 GB 120 D
BSM 100 GAL 120 D

V_{CE} = 1200 V
I_C = 2 x 135 A at T_C = 25 °C
I_C = 2 x 100 A at T_C = 80 °C

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 5a, 5b[1)]



Half-bridge		Chopper	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 100 GB 120 D	C67076-A2107-A2	BSM 100 GAL 120 D	C67076-A2012-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	135 100	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	270 200	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	1000	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.13	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 2 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 8 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 100 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 2000 –	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 100 A	g_{fs}	36	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	16000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	1300	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	500	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

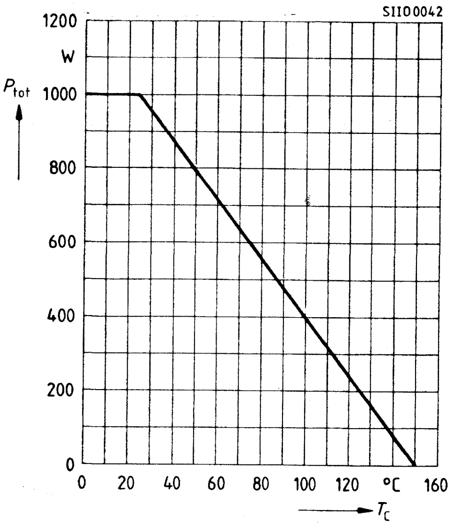
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	100	180	220	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	450	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	550	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	100	180	220	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	28	56	85	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	410	550	660	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	60	85	110	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 100 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	6 5	– –	mWs

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

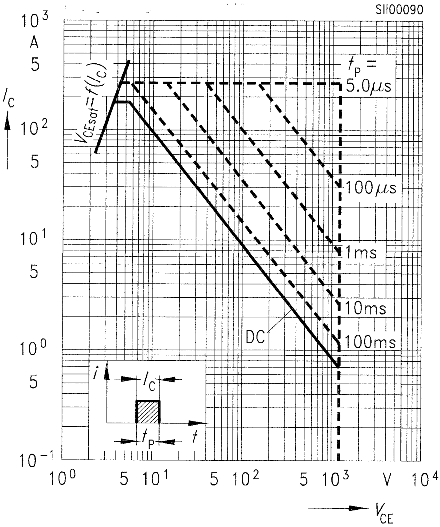
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 100 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.45 1.9	 – –	V
Reverse recovery time I_F = 100 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 125 °C	t_{rr}	 –	 0.3	 –	µs
Reverse recovery charge I_F = 100 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 6 18	 – –	µC
Soft factor I_F = 100 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.5	K/W

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

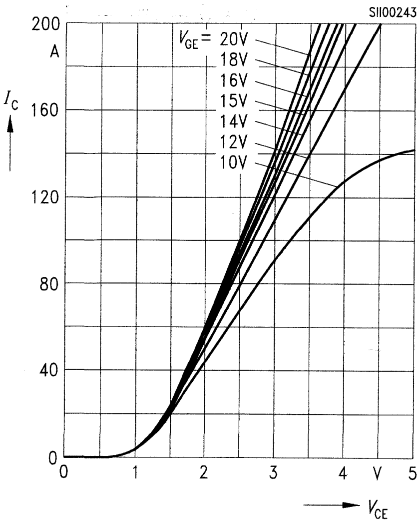
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



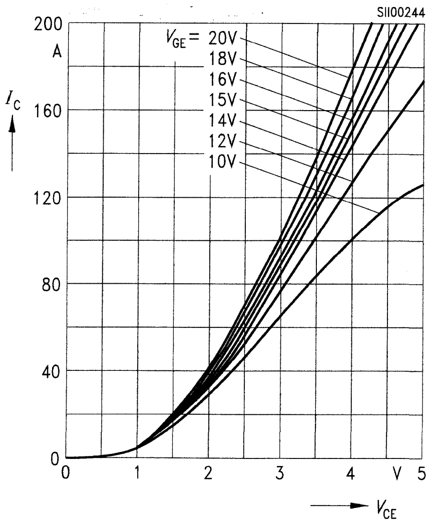
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



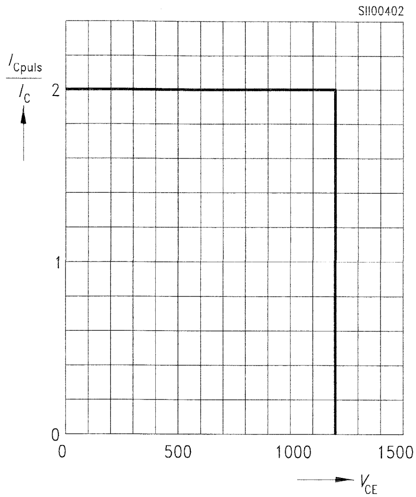
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



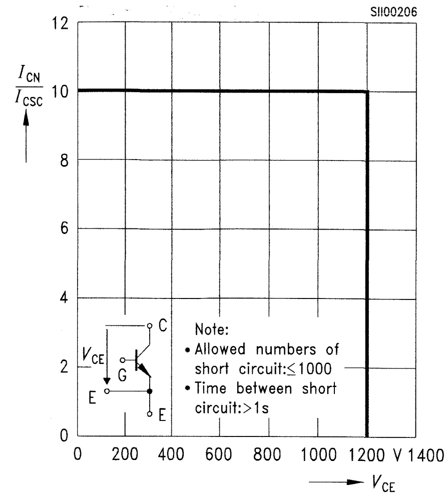
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



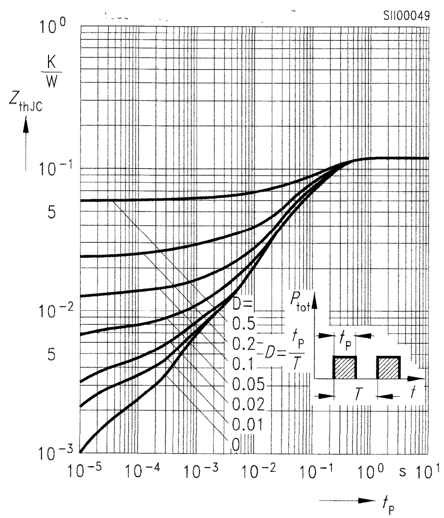
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



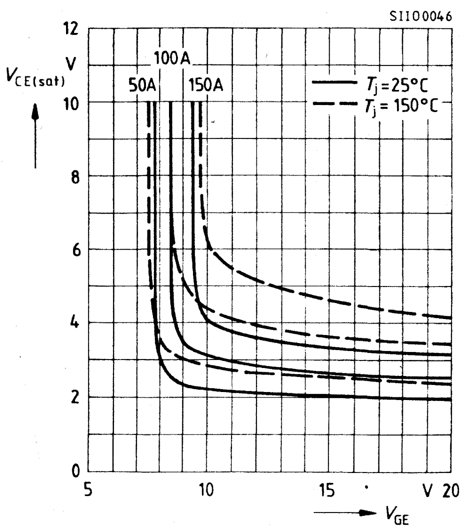
Safe operating area,
short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



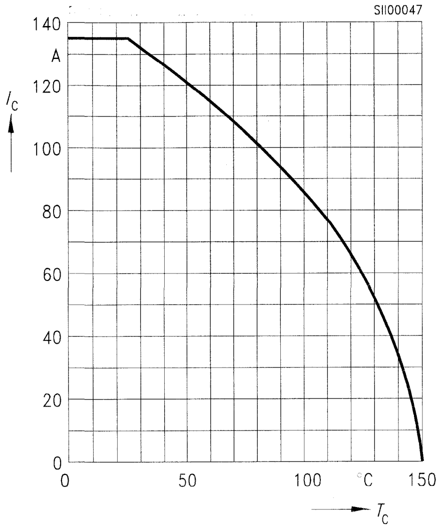
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



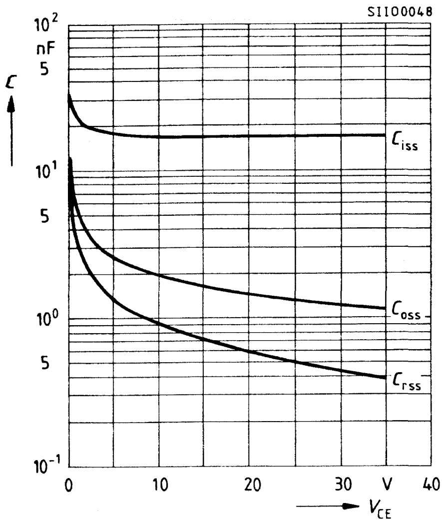
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



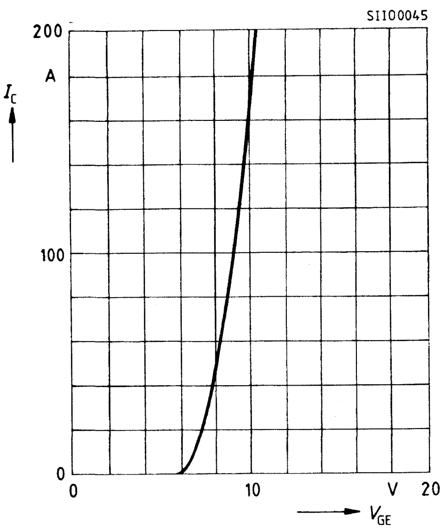
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



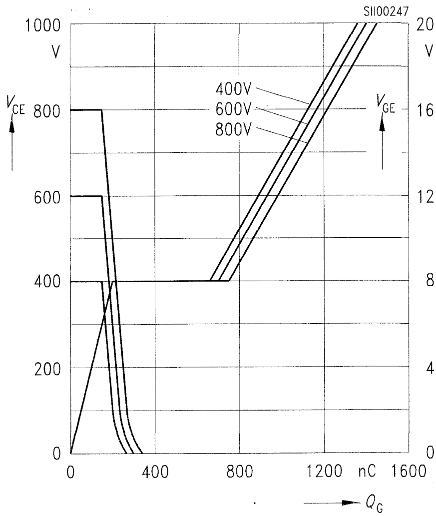
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



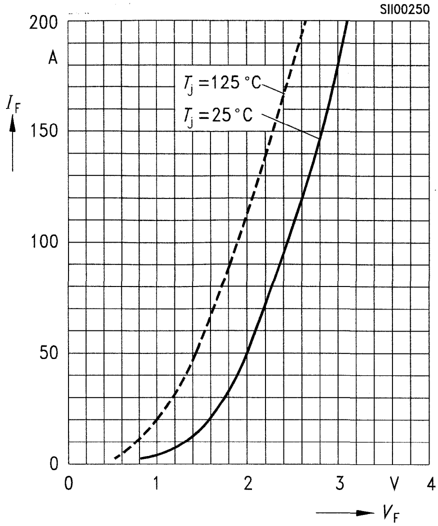
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



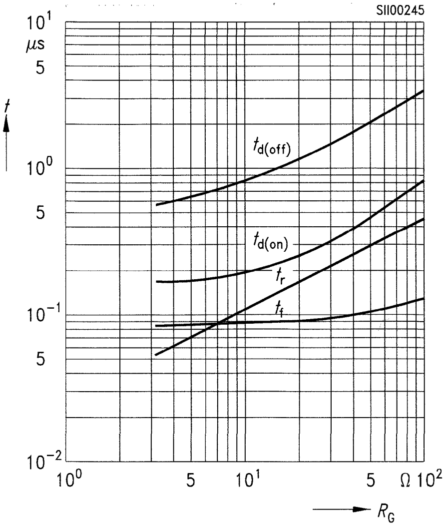
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



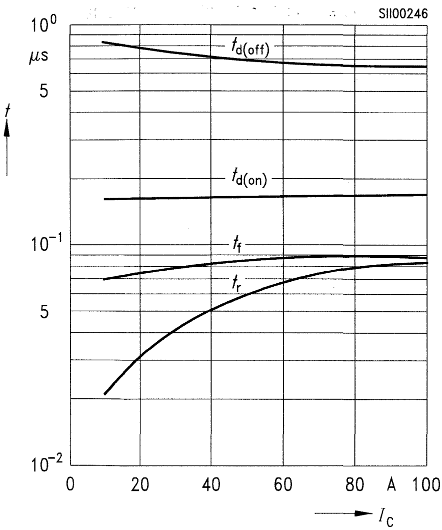
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 100 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 5.6 Ω



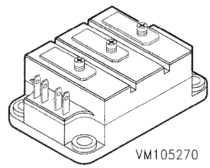
SIEMENS

IGBT Module
Preliminary Data

BSM 150 GB 100 D
BSM 150 GAL 100 D

V_{CE} **= 1000 V**
I_C **= 2 x 200 A at** T_C **= 25 °C**
I_C **= 2 x 150 A at** T_C **= 80 °C**

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 5a, 5b[1]



Half-bridge		**Chopper**	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 150 GB 100 D	C67076-A2102-A2	BSM 150 GAL 100 D	C67076-A2005-A2

Maximum Ratings

Parameter	**Symbol**	**Values**	**Unit**
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	200 150	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	400 300	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	1250	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.1	K/W
Insulation test voltage[2], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

[1] See chapter Package Outline and Circuit Diagrams.
[2] Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 2.8 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 10 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 150 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 2800 –	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 150 A	g_{fs}	54	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	22000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	1700	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	700	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	–	200	–	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	400	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	1100	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	120	200	250	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	50	100	150	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	480	650	800	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	65	90	120	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	9 7		mWs

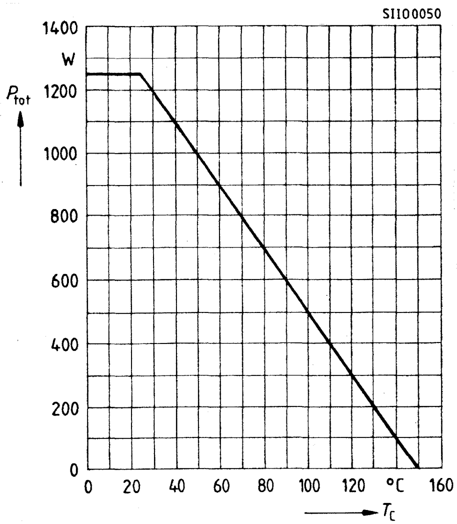
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

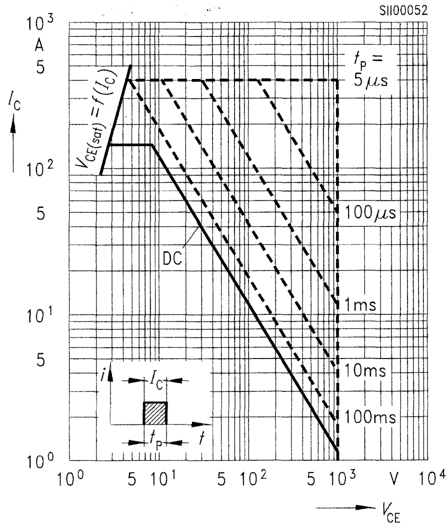
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 150 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.0 1.6	 – –	V
Reverse recovery time I_F = 150 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 125 °C	t_{rr}	 –	 0.35	 –	µs
Reverse recovery charge I_F = 150 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 8 27	 – –	µC
Soft factor I_F = 150 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.38	K/W

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

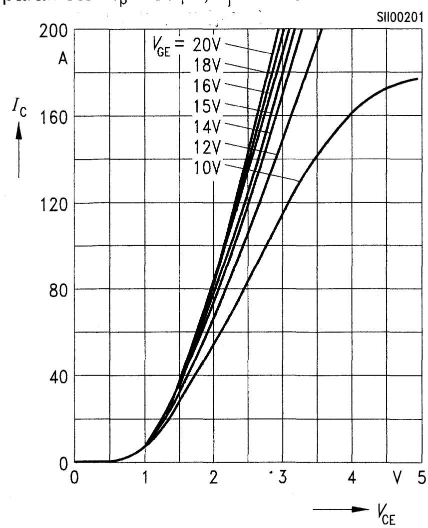
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



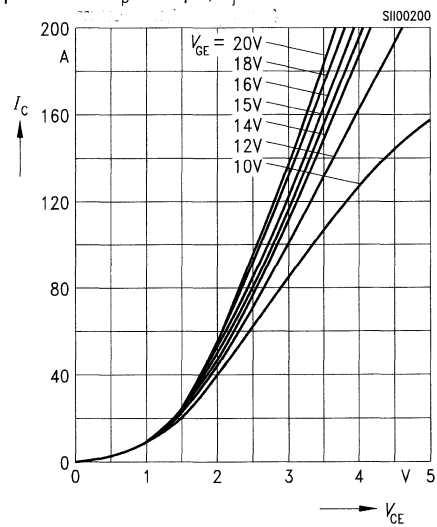
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



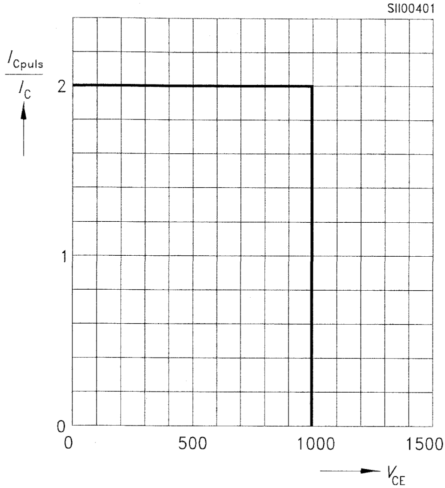
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C



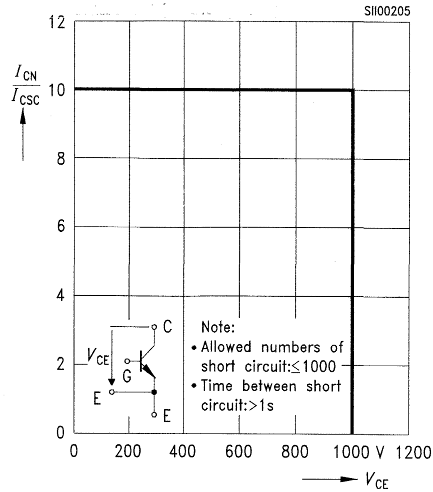
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



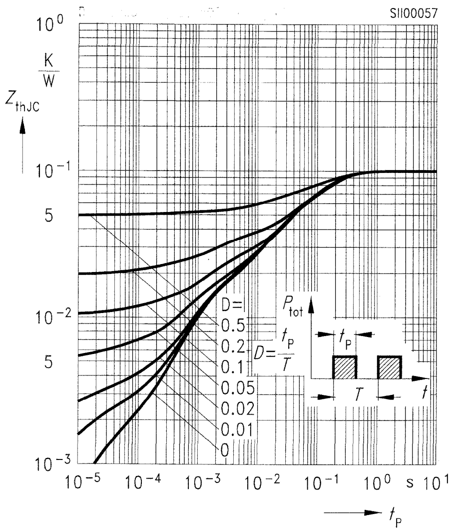
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



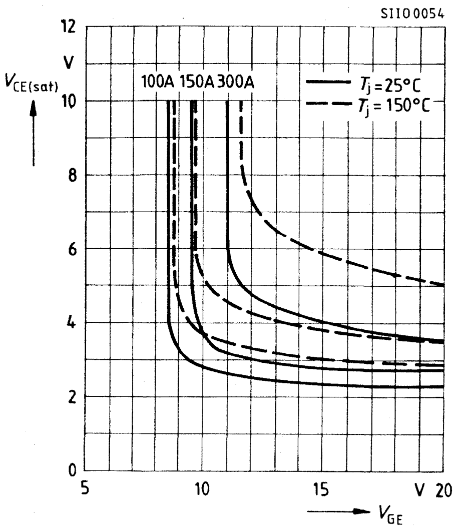
Safe operating area, short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



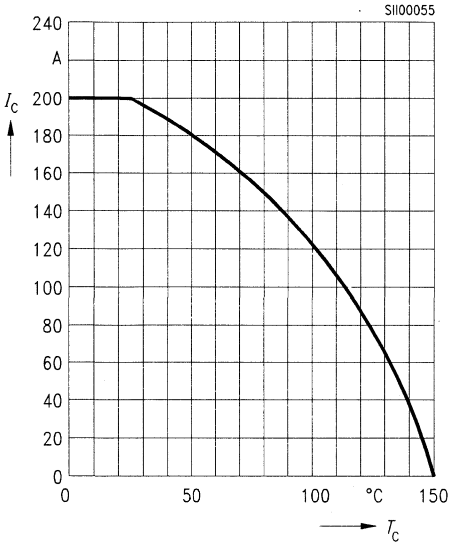
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



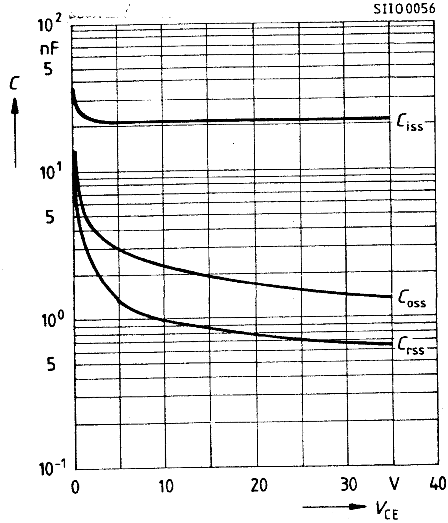
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



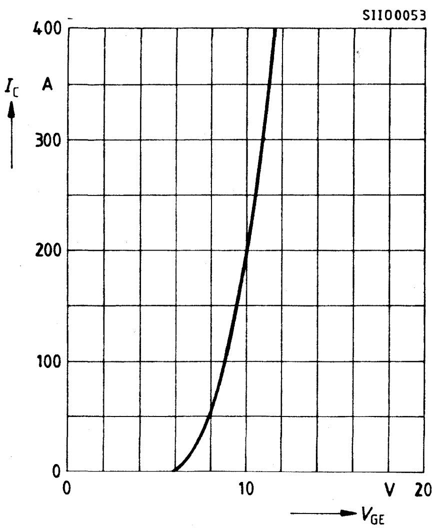
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



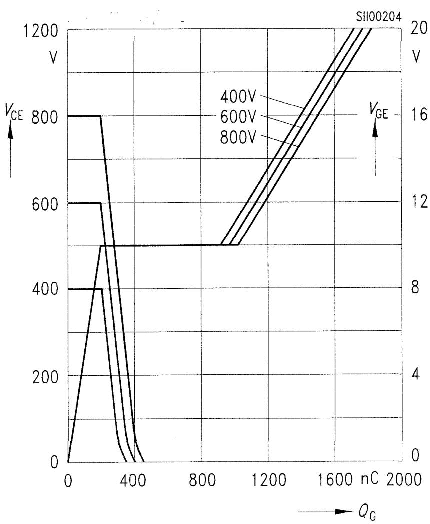
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



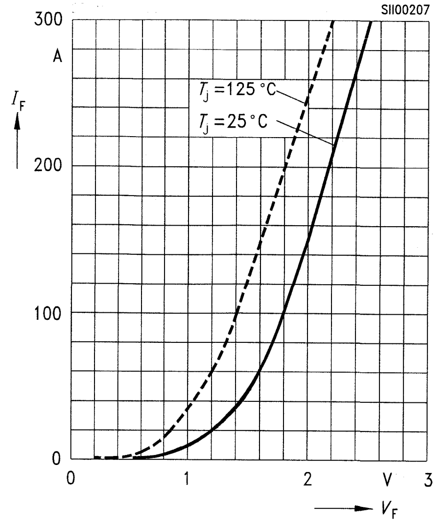
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



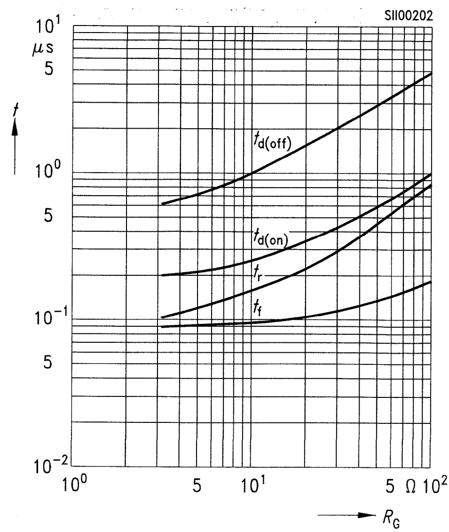
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



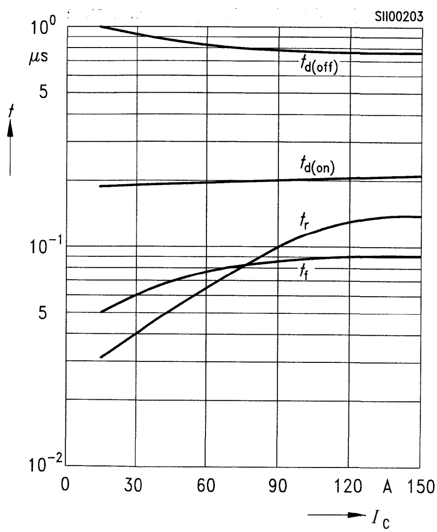
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 150 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 5.6 Ω



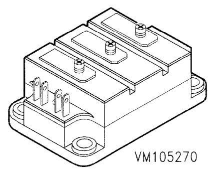
SIEMENS

IGBT Module
Preliminary Data

BSM 150 GB 120 D
BSM 150 GAL 120 D

V_{CE} = 1200 V
I_C = 2 x 200 A at T_C = 25 °C
I_C = 2 x 150 A at T_C = 80 °C

- Power module
- Half-bridge/Chopper
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 5a, 5b[1)]



Half-bridge		**Chopper**	
Type	**Ordering Code**	**Type**	**Ordering Code**
BSM 150 GB 120 D	C67076-A2108-A2	BSM 150 GAL 120 D	C67076-A2013-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	200 150	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	400 300	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	1250	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.1	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 2.8 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 10 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 150 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 2800 –	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 150 A	g_{fs}	54	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	22000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	1700	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	700	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

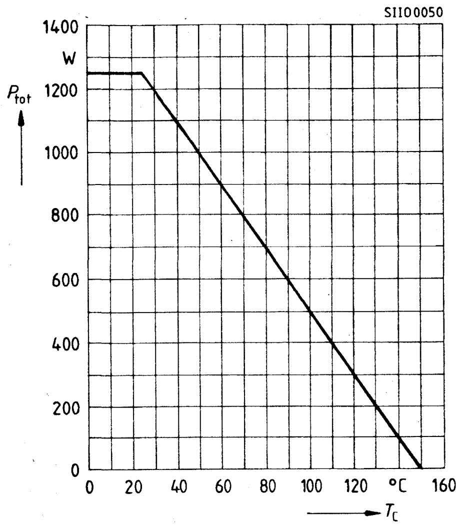
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	–	200	–	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	400	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	1100	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	120	200	250	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	50	100	150	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	480	650	800	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	65	90	120	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 150 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	9 7		mWs

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

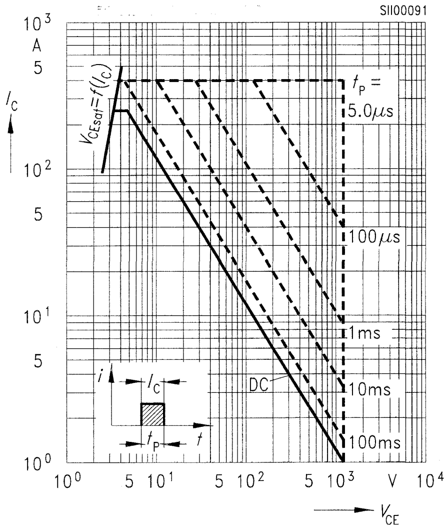
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 150 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.55 2.15	 – –	V
Reverse recovery time I_F = 150 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 125 °C	t_{rr}	 –	 0.35	 –	µs
Reverse recovery charge I_F = 150 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 8 27	 – –	µC
Soft factor I_F = 150 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 1500 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.38	K/W

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

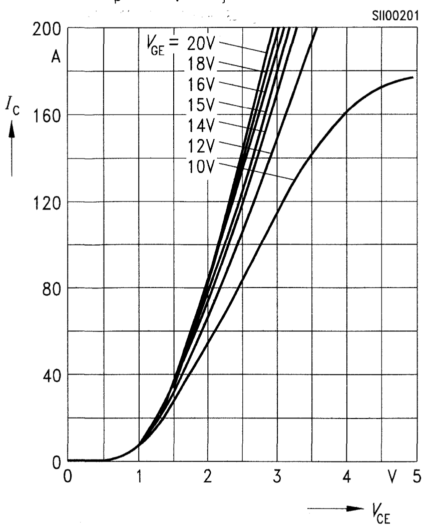
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



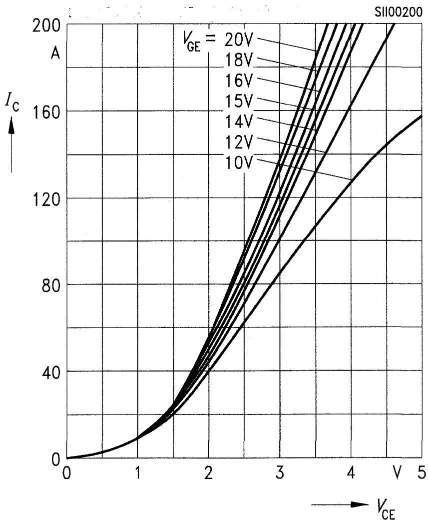
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
T_j ≤ 150 °C



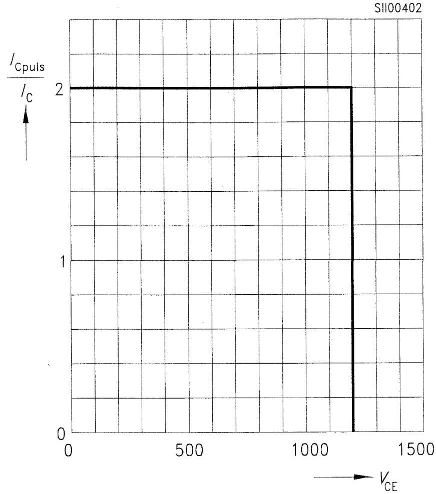
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, T_j ≤ 25 °C



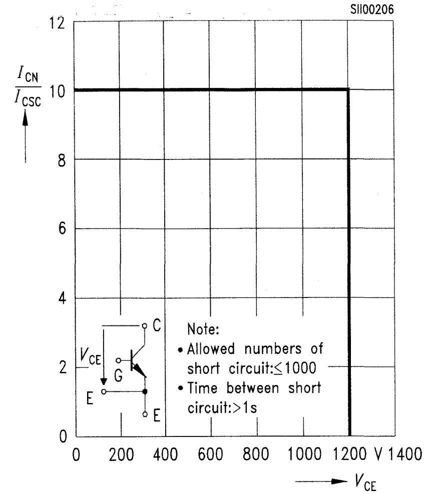
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, T_j ≤ 125 °C



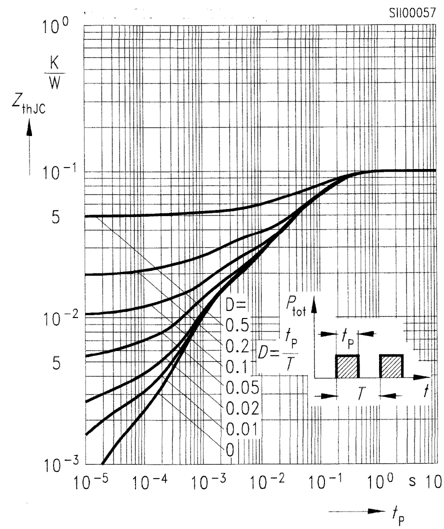
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



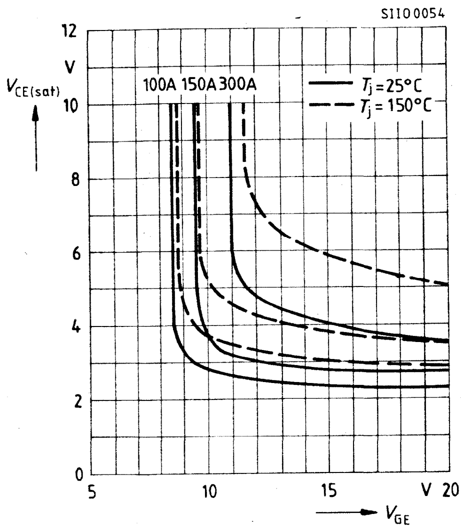
Safe operating area,
short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



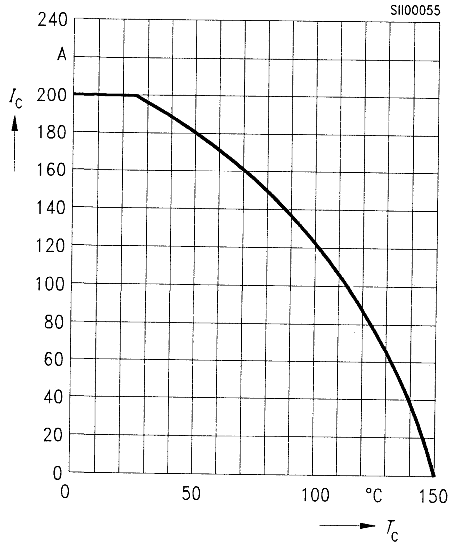
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



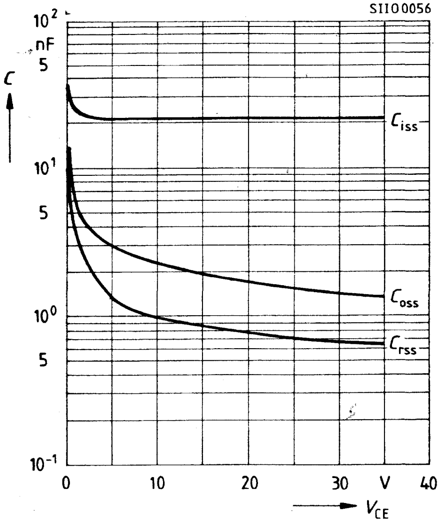
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



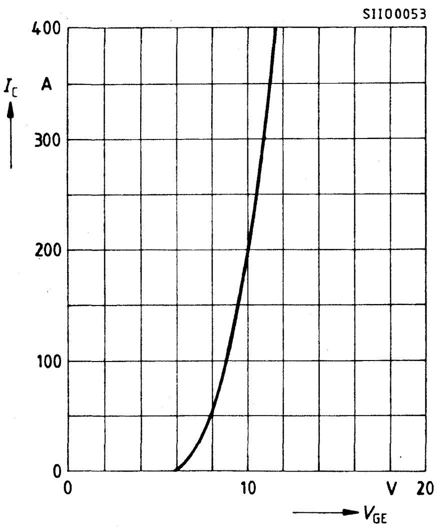
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



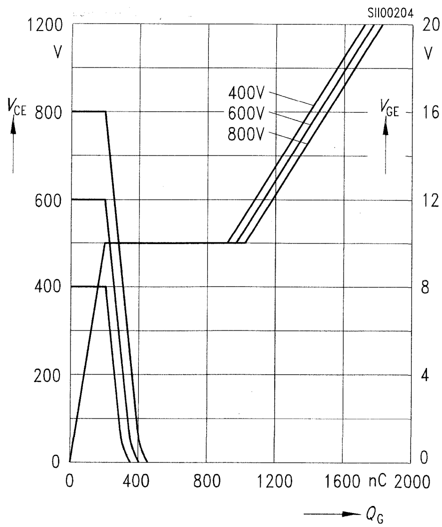
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



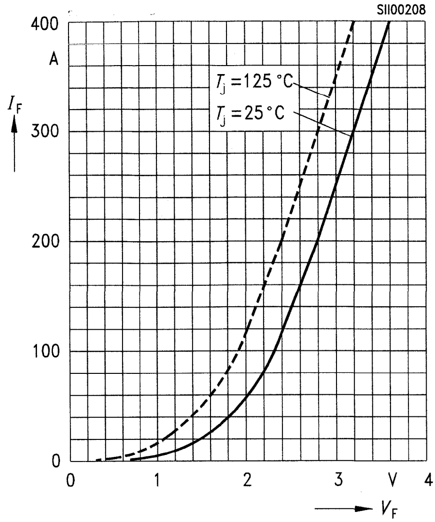
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



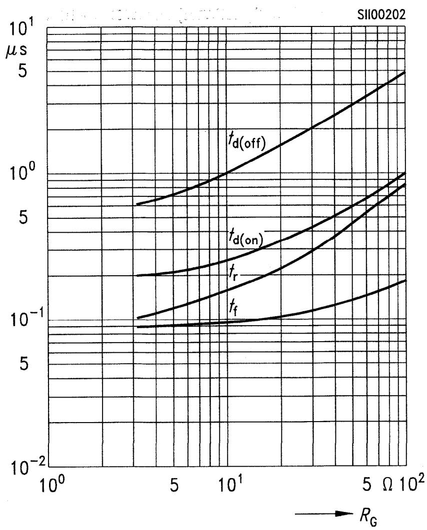
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



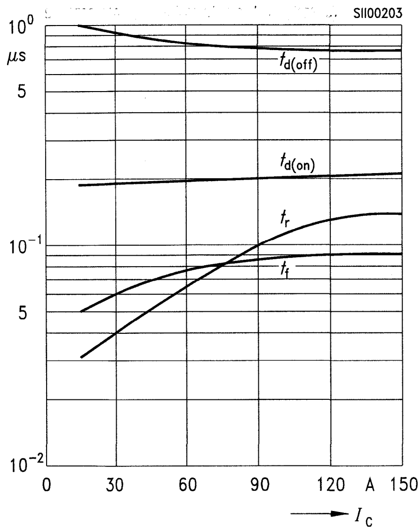
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 150 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 5.6 Ω



SIEMENS

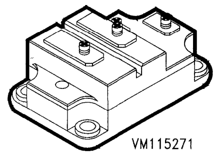
IGBT Module

BSM 200 GA 100 D

Preliminary Data

V_{CE} = 1000 V
I_C = 275 A at T_C = 25 °C
I_C = 200 A at T_C = 80 °C

- Power module
- Single switch
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 4[1)]



Single switch

Type	**Ordering Code**
BSM 200 GA 100 D	C67076-A2001-A2

Maximum Ratings

Parameter	**Symbol**	**Values**	**Unit**
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	275 200	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	550 400	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	1750	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.07	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 4 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 16 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 200 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 4000 	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 200 A	g_{fs}	72		–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	32000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	2600	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	1000	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	–	200	–	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	440	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	730	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	120	200	250	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	45	90	140	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	550	730	900	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	80	110	140	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	15 10	– –	mWs

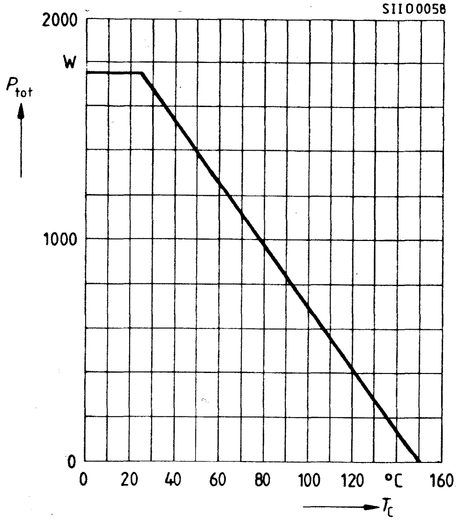
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

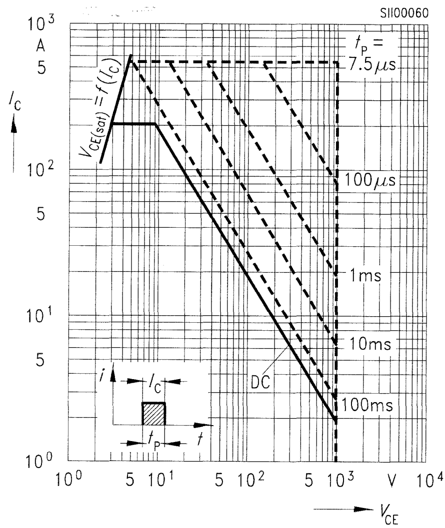
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 200 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 1.85 1.45	 – –	V
Reverse recovery time I_F = 200 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.4	 –	µs
Reverse recovery charge I_F = 200 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 3000 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 12 36	 – –	µC
Soft factor I_F = 200 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 3000 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.25	K/W

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

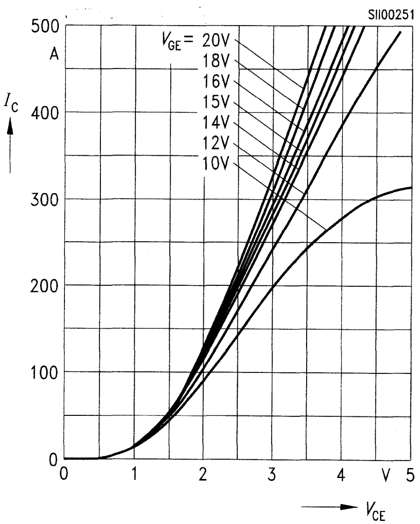
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



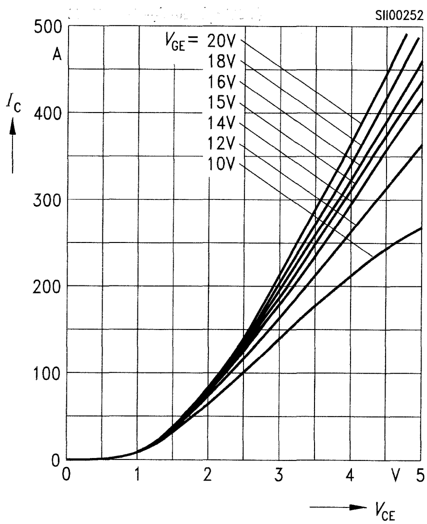
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq 150$ °C



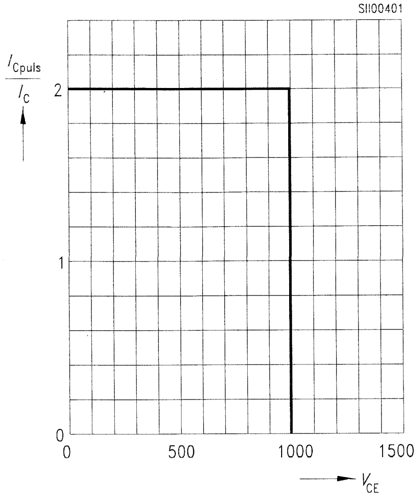
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 μs, $T_j \leq 25$ °C



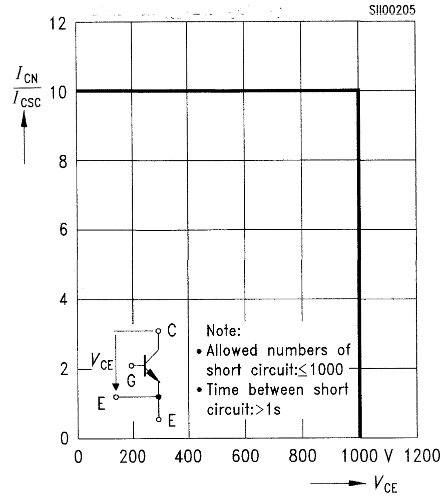
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 μs, $T_j \leq 125$ °C



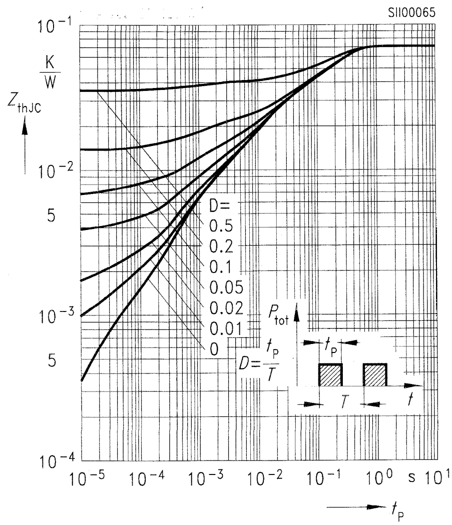
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



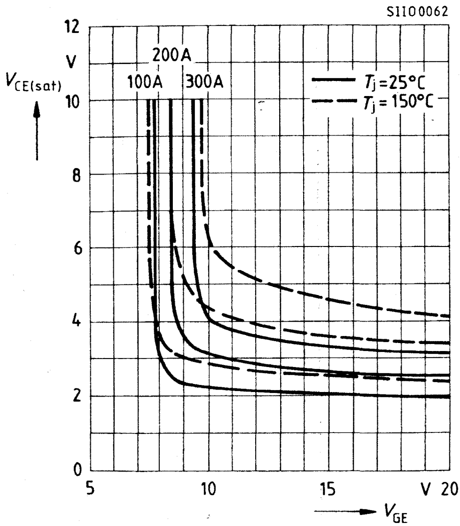
Safe operating area, short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 80 nH



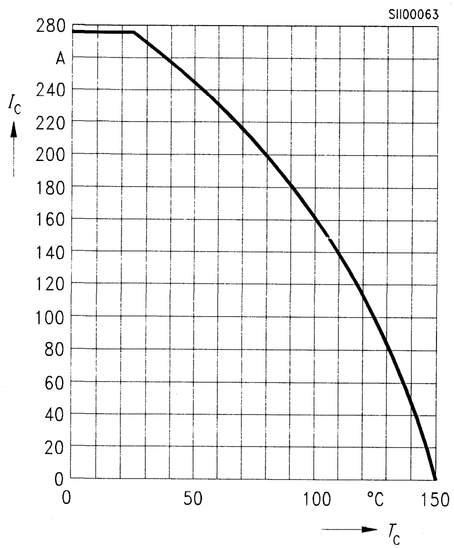
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



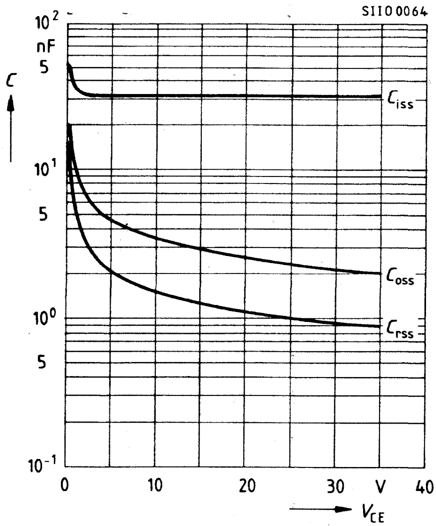
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



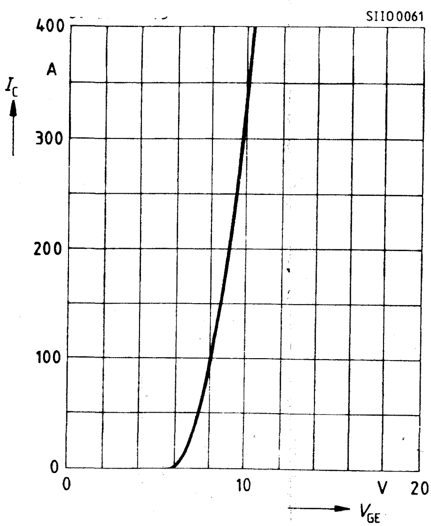
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



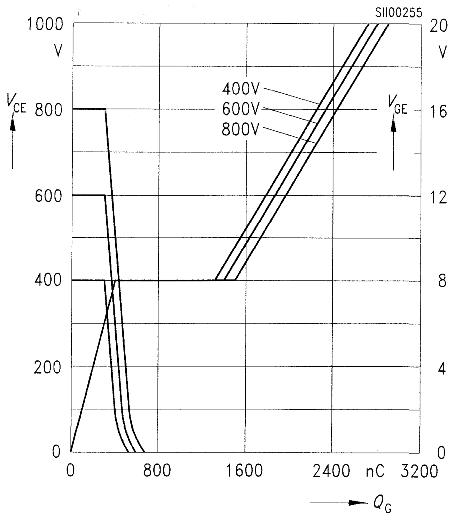
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



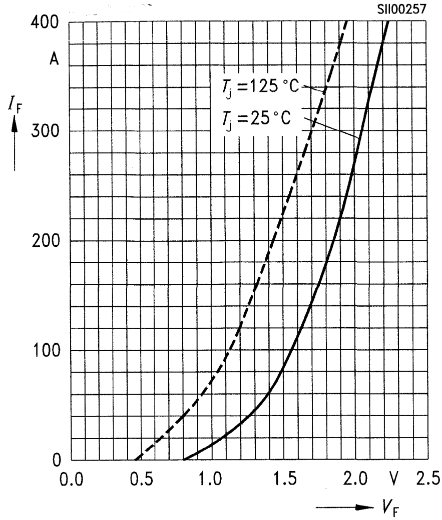
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



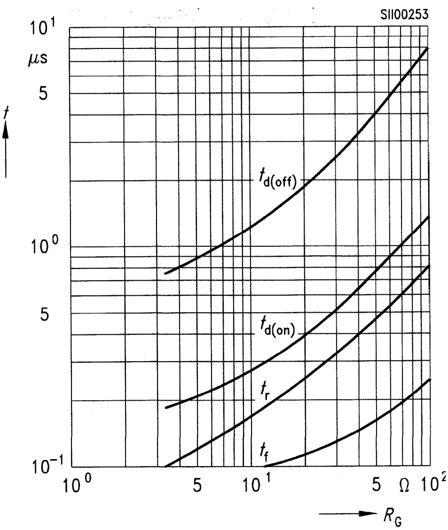
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



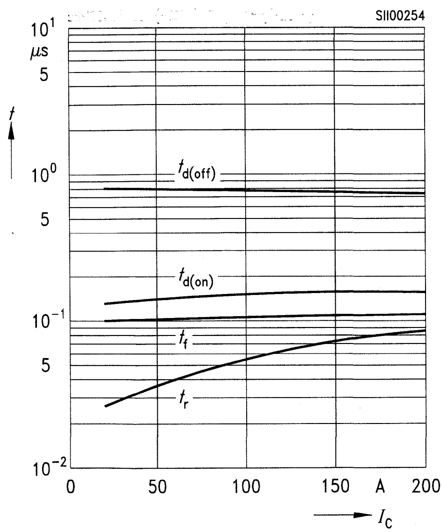
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 200 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 3.3 Ω



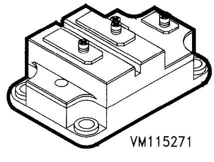
SIEMENS

IGBT Module **BSM 200 GA 120 D**

Preliminary Data

V_{CE} = 1200 V
I_C = 275 A at T_C = 25 °C
I_C = 200 A at T_C = 80 °C

- Power module
- Single switch
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 4[1)]



Type	Ordering Code
BSM 200 GA 120 D	C67076-A2006-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	275 200	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	550 400	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	1750	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.07	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 4 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 16 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 200 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 4000 	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 200 A	g_{fs}	72	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	32000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	2600	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	1000	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	–	200	–	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	440	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	730	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	120	200	250	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	45	90	140	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	550	730	900	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	80	110	140	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 200 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	15 10	– –	mWs

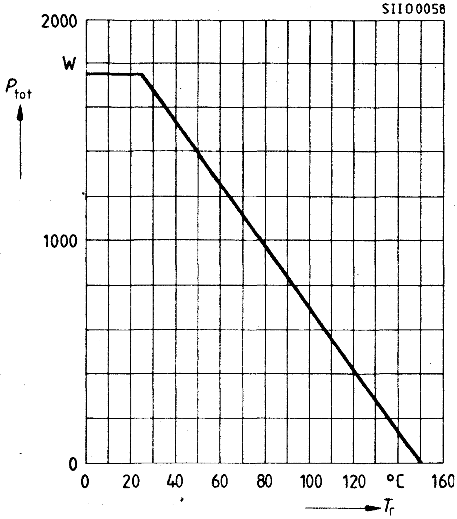
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

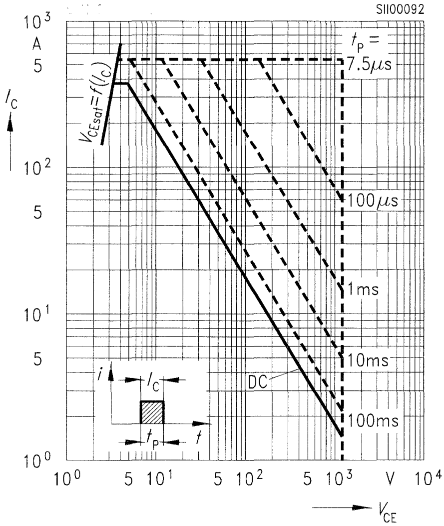
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 200 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.45 1.9	 – –	V
Reverse recovery time I_F = 200 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.4	 –	µs
Reverse recovery charge I_F = 200 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 3000 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 12 36	 – –	µC
Soft factor I_F = 200 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 3000 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.25	K/W

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

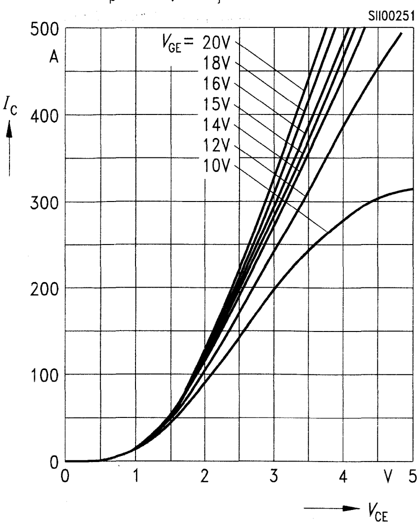
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



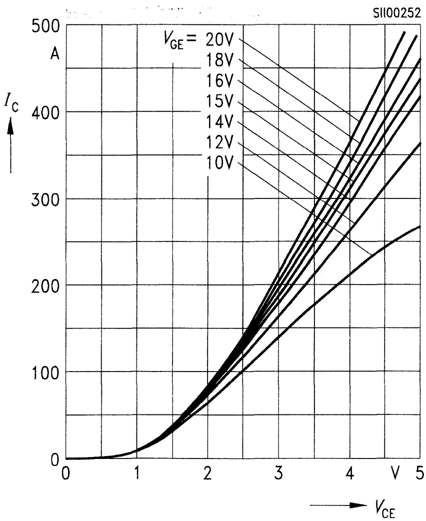
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
T_j ≤ 150 °C



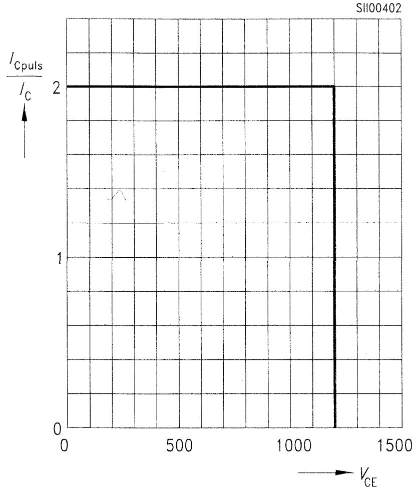
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, T_j ≤ 25 °C



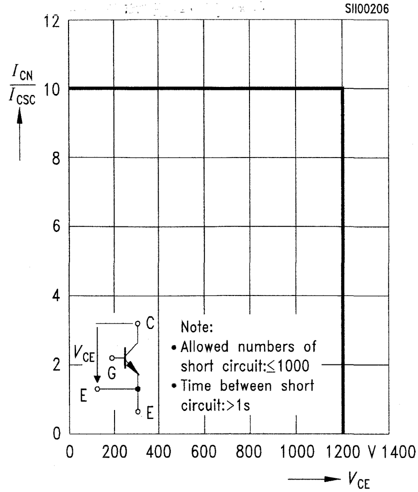
Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, T_j ≤ 125 °C



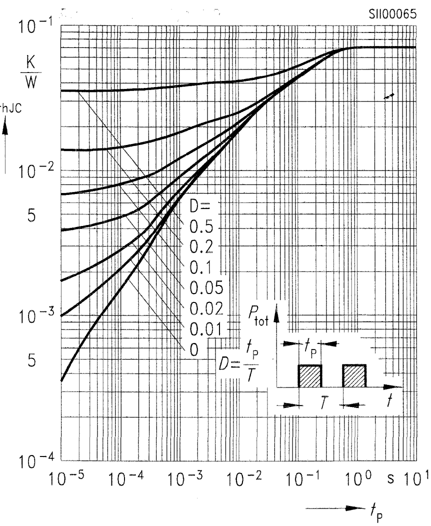
Reverse biased safe operating area
$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



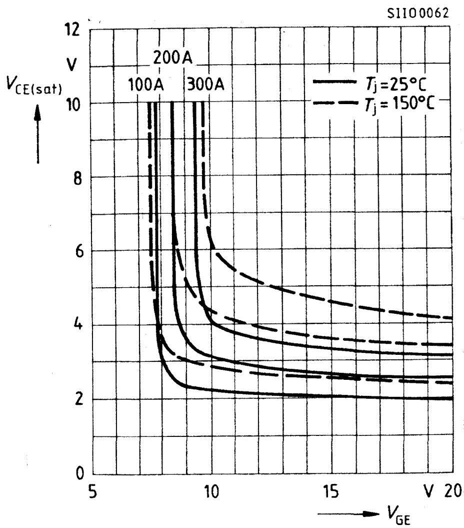
Safe operating area, short circuit $I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 80 nH



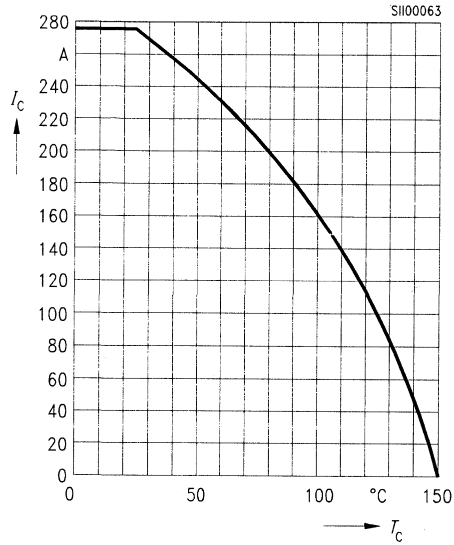
Transient thermal impedance
$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$



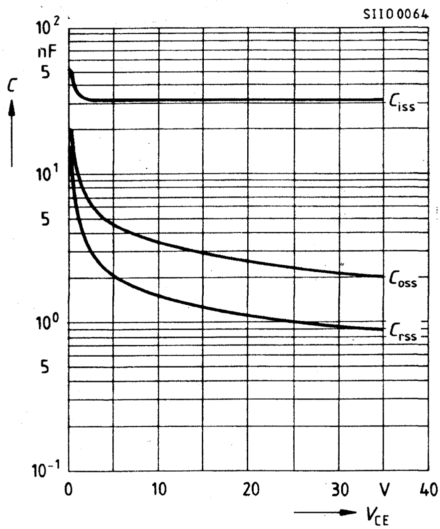
Typ. on-state characteristics
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



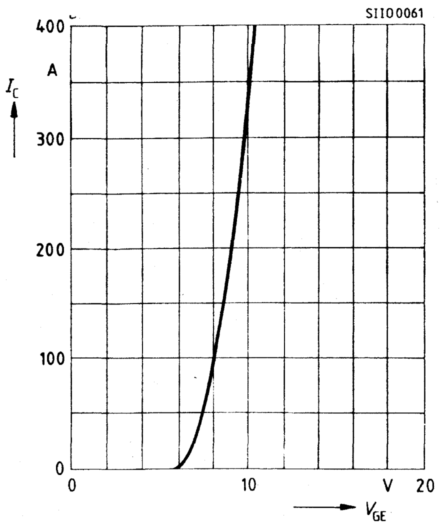
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



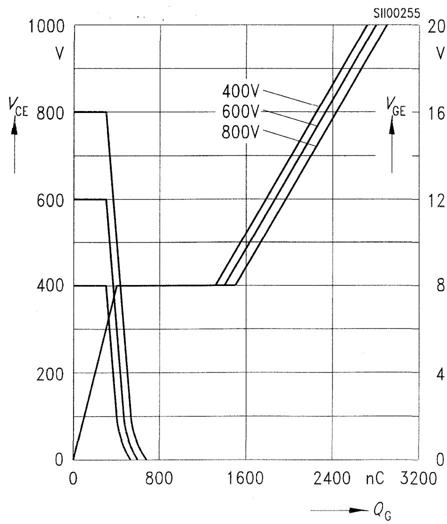
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



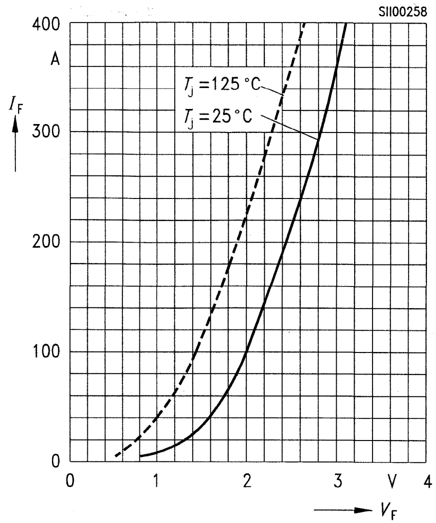
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



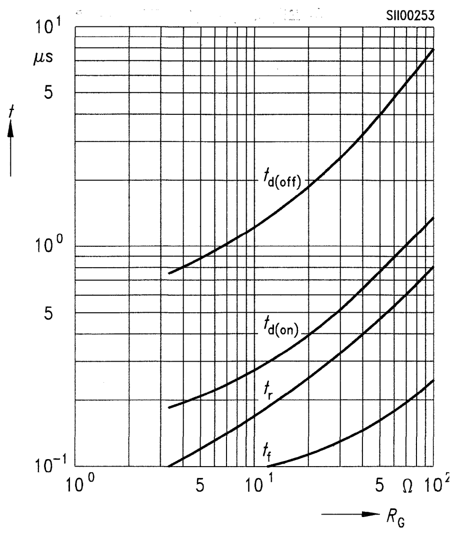
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



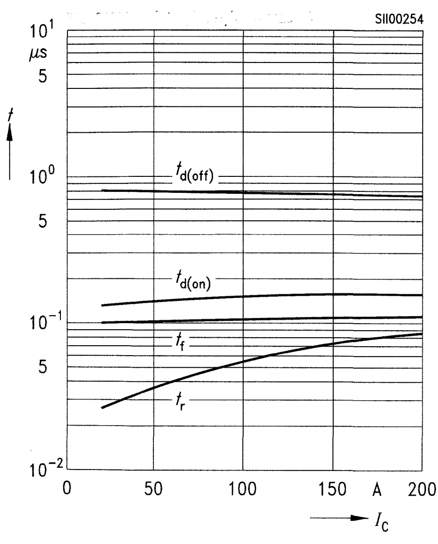
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 200 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 3.3 Ω



SIEMENS

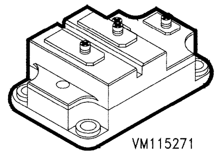
IGBT Module

Preliminary Data

BSM 300 GA 100 D

V_{CE} = **1000 V**
I_C = **400 A at** T_C = **25 °C**
I_C = **300 A at** T_C = **80 °C**

- Power module
- Single switch
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 4[1)]



Type	Ordering Code
BSM 300 GA 100 D	C67076-A2000-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1000	V
Collector-gate voltage, R_{GE} = 20 kΩ	V_{CGR}	1000	
Gate-emitter voltage	V_{GE}	± 20	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	400 300	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	800 600	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	2500	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.05	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 5.6 mA	$V_{(BR)CES}$	1000	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 20 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 300 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1000 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 5500 	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 300 A	g_{fs}	108	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	44000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	3400	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	1400	–	

Switching Characteristics
at T_j = 125 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	130	220	270	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	650	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	850	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	130	220	270	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	70	120	170	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	630	850	1000	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	75	110	130	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	24 14	– –	mWs

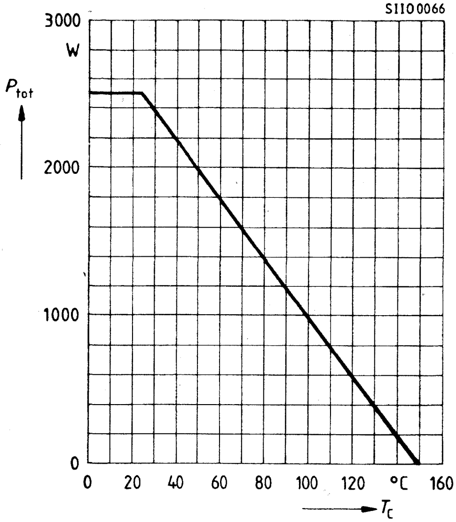
Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

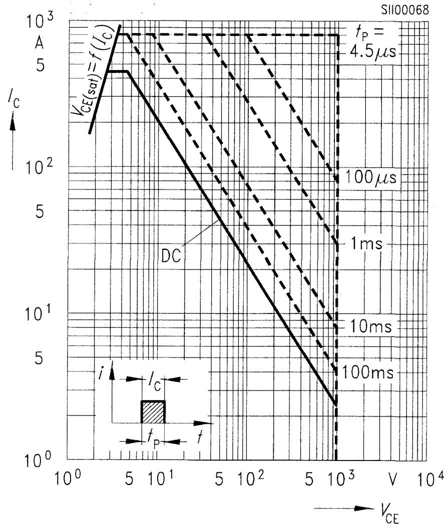
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 300 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.0 1.6	 – –	V
Reverse recovery time I_F = 300 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.5	 –	µs
Reverse recovery charge I_F = 300 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 3000 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 18 54	 – –	µC
Soft factor I_F = 300 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 3000 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.18	K/W

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

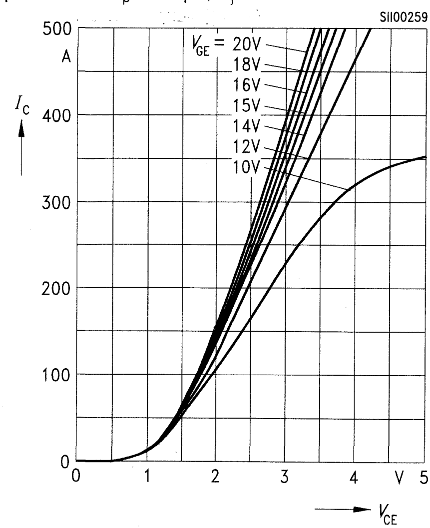
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



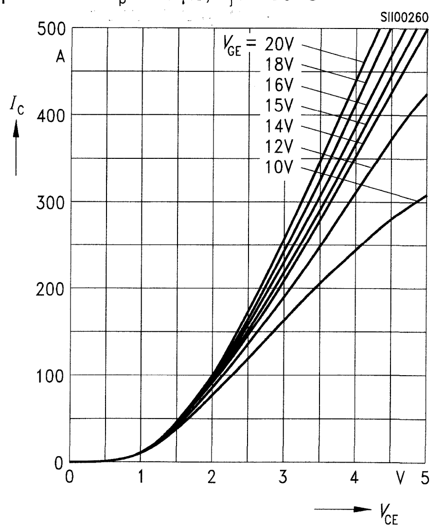
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
$T_j \leq$ 150 °C



Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 25 °C

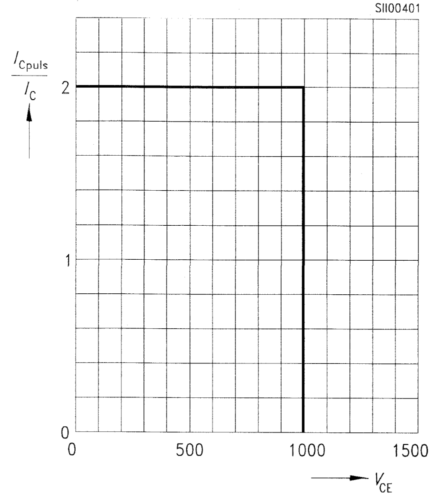


Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, $T_j \leq$ 125 °C



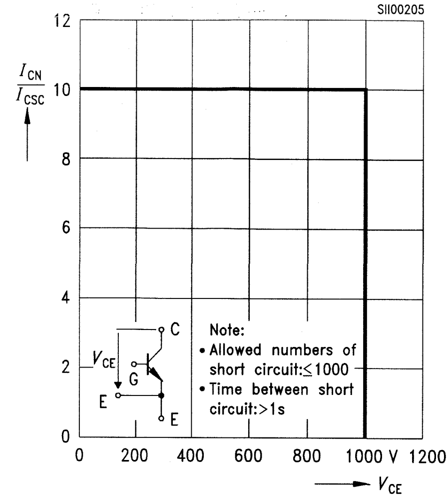
Reverse biased safe operating area

$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



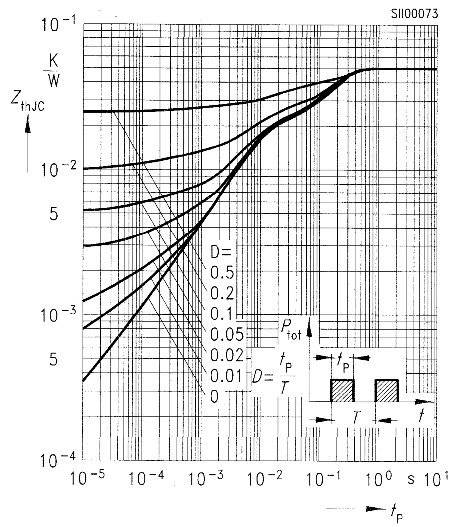
Safe operating area, short circuit

$I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 80 nH



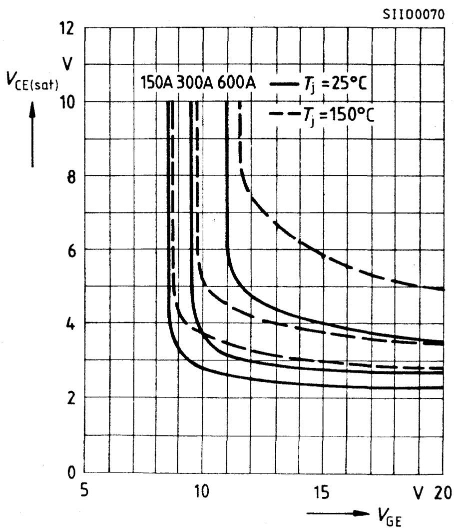
Transient thermal impedance

$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$

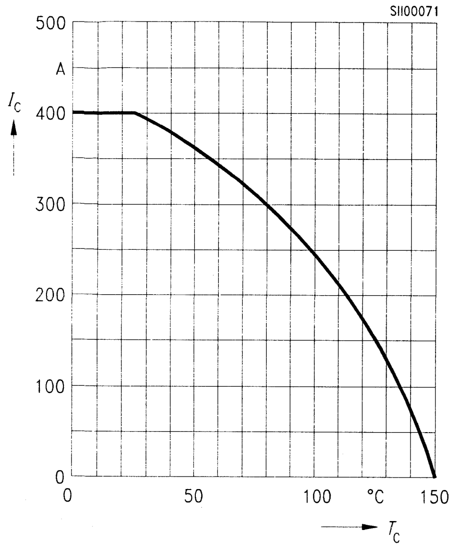


Typ. on-state characteristics

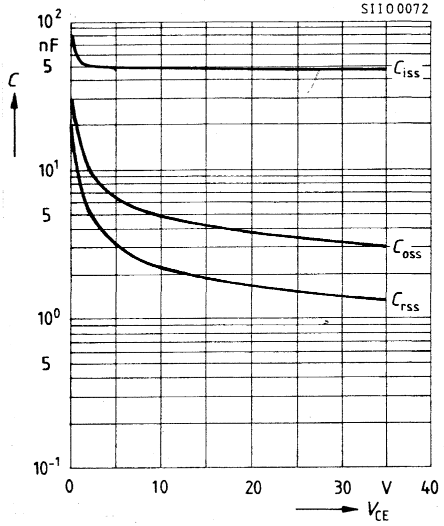
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



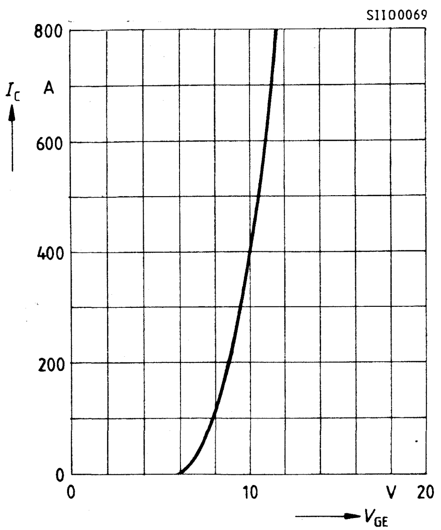
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



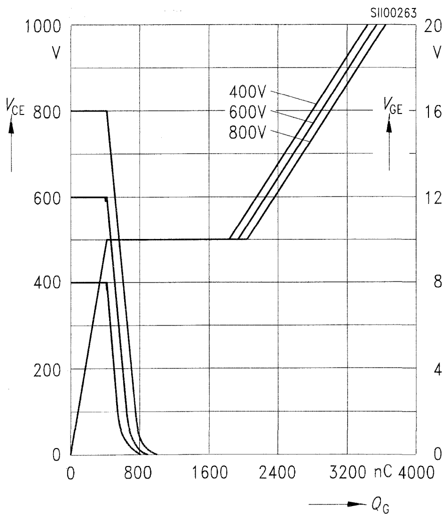
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0, f = 1$ MHz



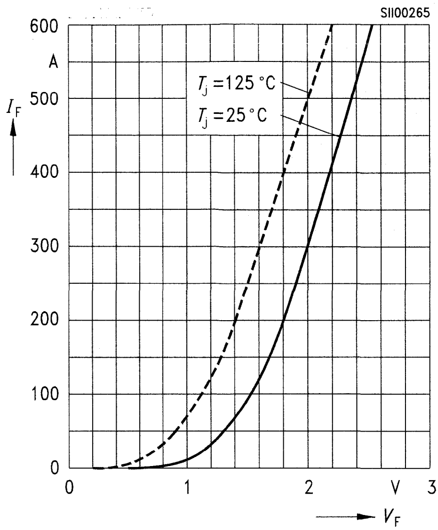
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



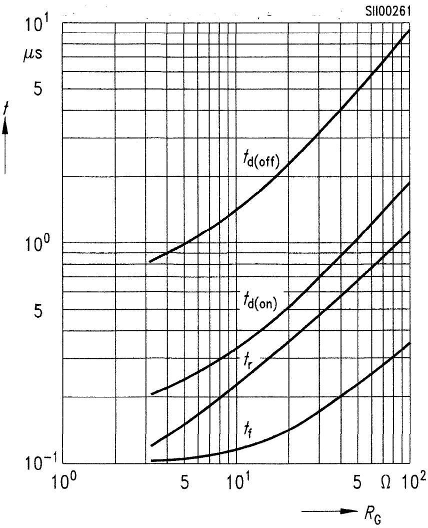
Typ. gate charge $V_{CE}, V_{GE} = f(Q_G)$



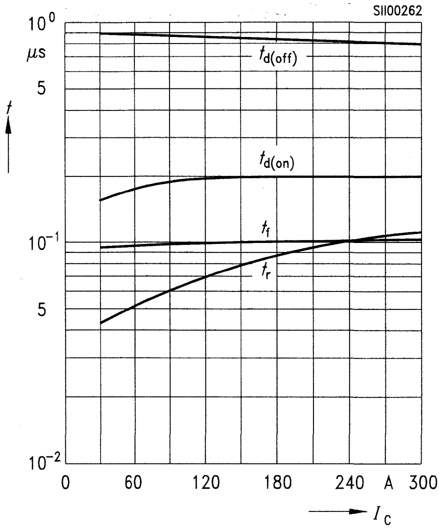
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 300 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 3.3 Ω



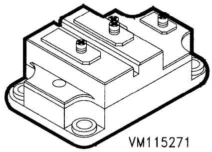
SIEMENS

IGBT Module
Preliminary Data

BSM 300 GA 120 D

V_{CE} = 1200 V
I_C = 400 A at T_C = 25 °C
I_C = 300 A at T_C = 80 °C

- Power module
- Single switch
- Including fast free-wheel diodes
- Package with insulated metal base plate
- Package outlines/Circuit diagram: 4[1)]


VM115271

Type	Ordering Code
BSM 300 GA 120 D	C67076-A2007-A2

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	
Continuous collector current, T_C = 25 °C T_C = 80 °C	I_C	400 300	A
Pulsed collector current, T_C = 25 °C T_C = 80 °C	$I_{C\ puls}$	800 600	
Operating and storage temperature range	T_j, T_{stg}	- 55 ... + 150	°C
Power dissipation, T_C = 25 °C	P_{tot}	2500	W
Thermal resistance, chip-case	R_{thJC}	≤ 0.05	K/W
Insulation test voltage[2)], t = 1 min.	V_{is}	2500	V_{ac}
Creepage distance	–	16	mm
Clearance	–	11	
DIN humidity category, DIN 40 040	–	F	–
IEC climatic category, DIN IEC 68-1	–	55/150/56	

1) See chapter Package Outline and Circuit Diagrams.
2) Insulation test voltage between collector and metal base plate referred to standard climate 23/50 in acc. with DIN 50 014, IEC 146, para. 492.1.

Electrical Characteristics

at T_j = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Collector-emitter breakdown voltage V_{GE} = 0, I_C = 5.6 mA	$V_{(BR)CES}$	1200	–	–	V
Gate threshold voltage V_{GE} = V_{CE}, I_C = 20 mA	$V_{GE(th)}$	4.8	5.5	6.2	
Collector-emitter saturation voltage V_{GE} = 15 V, I_C = 300 A T_j = 25 °C T_j = 150 °C	$V_{CE(sat)}$	 – –	 2.8 4.0	 3.3 4.5	
Zero gate voltage collector current V_{CE} = 1200 V, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	I_{CES}	 – –	 – –	 5500 	µA
Gate-emitter leakage current V_{GE} = 20 V, V_{CE} = 0	I_{GES}	–	–	100	nA
AC Characteristics					
Forward transconductance V_{CE} = 20 V, I_C = 300 A	g_{fs}	108	–	–	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{iss}	–	44000	–	pF
Output capacitance, V_{GS} = 0 V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{oss}	–	3400	–	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0, f = 1 MHz	C_{rss}	–	1400	–	

Switching Characteristics

at T_j = 125 °C, unless otherwise specified.

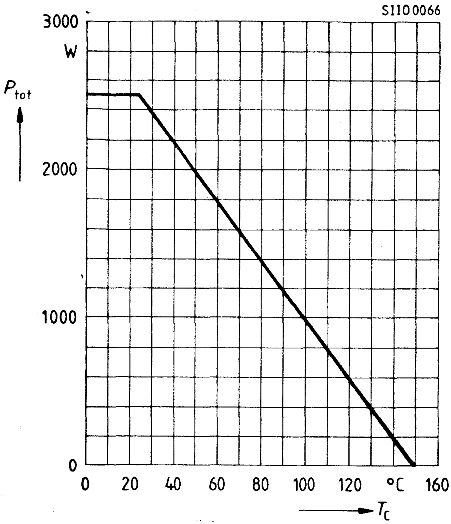
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Resistive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	130	220	270	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	–	650	–	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	–	850	–	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	–	500	–	
Inductive Load					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(on)}$	130	220	270	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_r	70	120	170	
Turn-off delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$t_{d\,(off)}$	630	850	1000	
Fall time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	t_f	75	110	130	
Turn-off loss ($E_{off} = E_{off\,1} + E_{off\,2}$) V_{CC} = 600 V, V_{GE} = 15 V, I_C = 300 A $R_{g\,(on)}$ = 3.3 Ω, $R_{g\,(off)}$ = 3.3 Ω	$E_{off\,1}$ $E_{off\,2}$	– –	24 14	– –	mWs

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

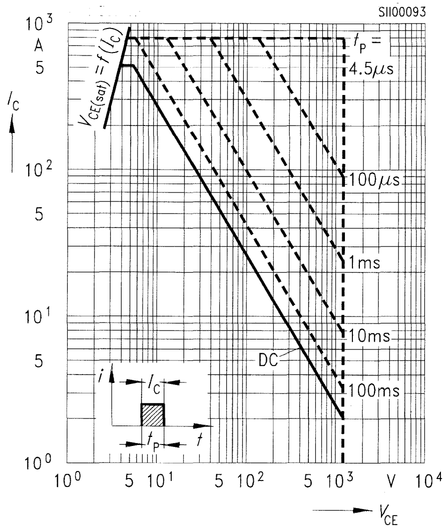
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Free-Wheel Diode					
Diode forward voltage I_F = 300 A, V_{GE} = 0 T_j = 25 °C T_j = 125 °C	V_F	 – –	 2.55 2.15	 – –	V
Reverse recovery time I_F = 300 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 800 A/µs T_j = 125 °C	t_{rr}	 –	 0.5	 –	µs
Reverse recovery charge I_F = 300 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 3000 A/µs T_j = 25 °C T_j = 125 °C	Q_{rr}	 – –	 18 54	 – –	µC
Soft factor I_F = 300 A, V_R = 600 V V_{GE} = 0, di_F/dt = – 3000 A/µs T_j = 125 °C	S	 –	 1	 –	–
Thermal resistance Chip-case	R_{thJC}	–	–	0.18	K/W

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

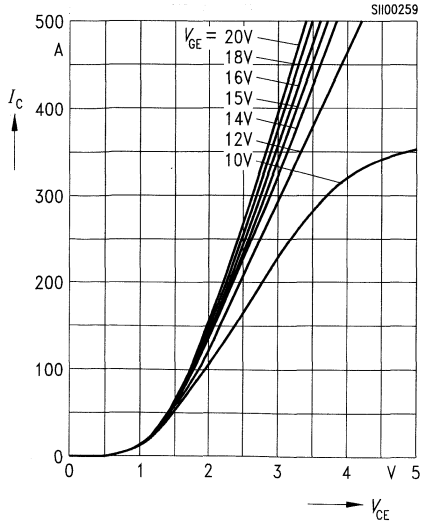
Power dissipation $P_{tot} = f(T_C)$
parameter: T_j = 150 °C



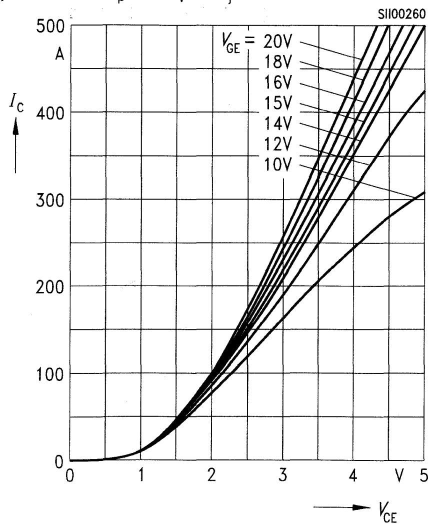
Safe operating area $I_C = f(V_{CE})$
parameter: single pulse, T_C = 25 °C
T_j ≤ 150 °C



Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, T_j ≤ 25 °C

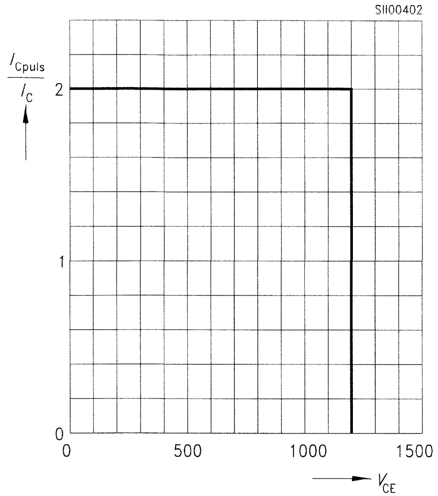


Typ. output characteristics $I_C = f(V_{CE})$
parameter: t_p = 80 µs, T_j ≤ 125 °C



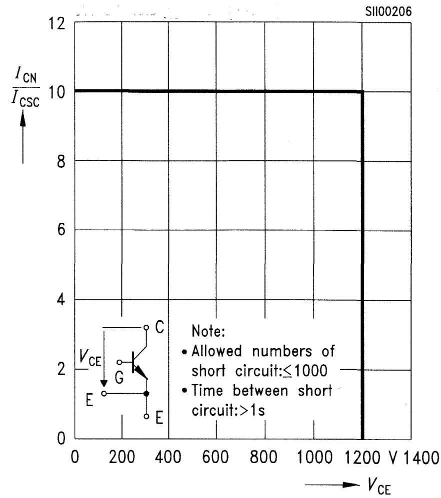
Reverse biased safe operating area

$I_C = f(V_{CE})$, parameter: T_j = 125 °C,
V_{GE} = 15 V, $R_{g(off)}$ = 3.3 Ω,
L (parastic inductance, module) < 50 nH



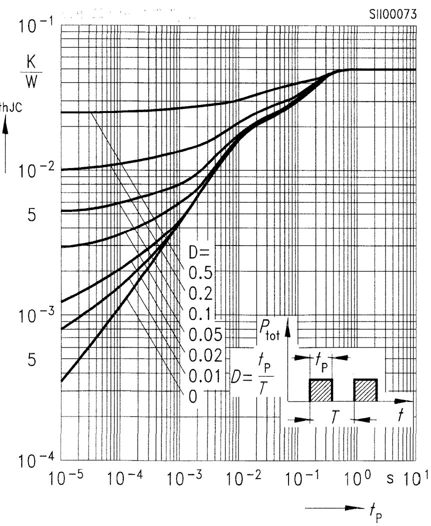
Safe operating area, short circuit

$I_C = f(V_{CE})$, V_{GE} = ± 15 V
T_j ≤ 150 °C, t_{SC} ≤ 10 µs, L < 50 nH



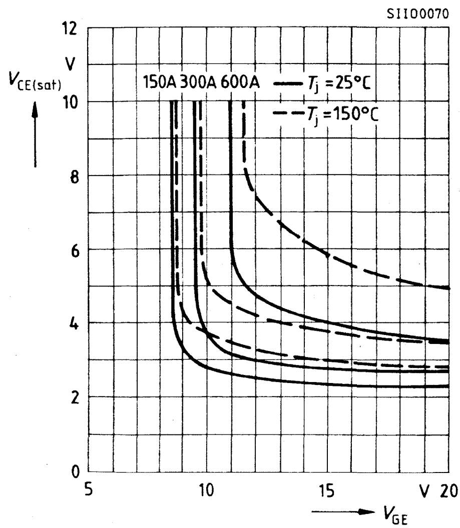
Transient thermal impedance

$Z_{thJC} = f(t_p)$, parameter: $D = t_p / T$

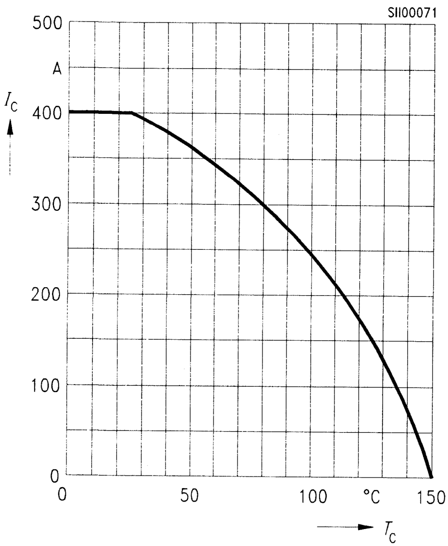


Typ. on-state characteristics

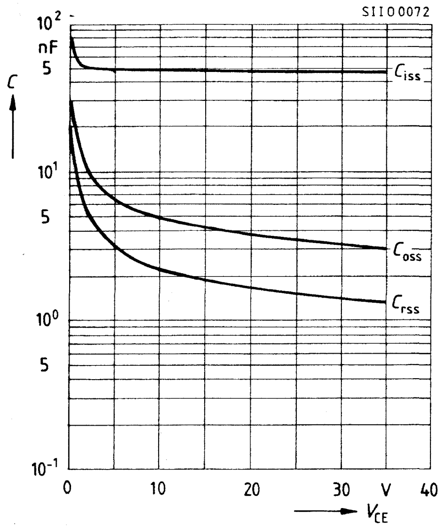
$V_{CE(sat)} = f(V_{GE})$, parameter: I_C, T_j



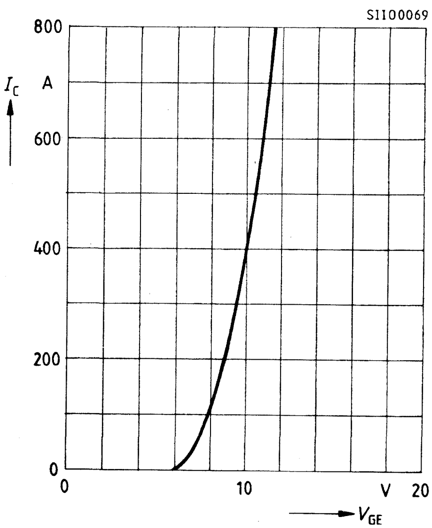
Collector current $I_C = f(T_C)$
parameter: $V_{GE} \geq 15$ V, $T_j = 150$ °C



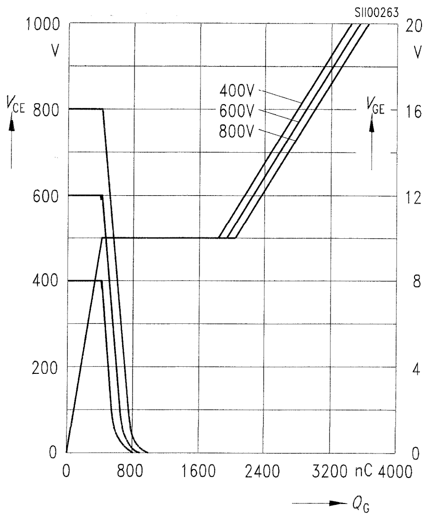
Typ. capacitances $C = f(V_{CE})$
parameter: $V_{GE} = 0$, $f = 1$ MHz



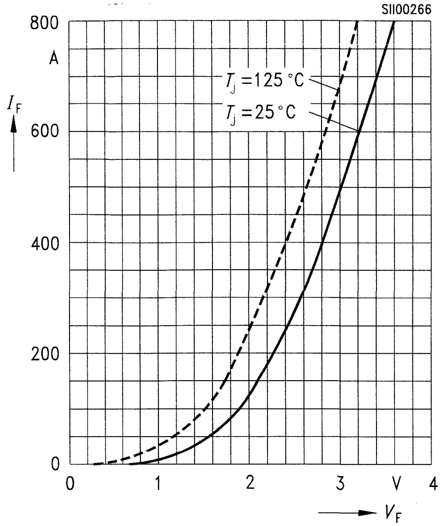
Typ. transfer characteristics $I_C = f(V_{GE})$
parameter: $t_p = 80$ µs, $V_{CE} = 20$ V



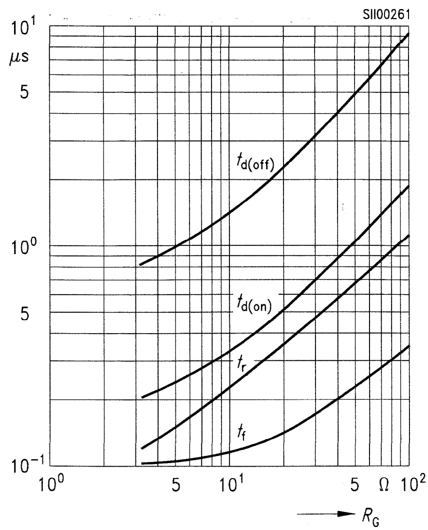
Typ. gate charge V_{CE}, $V_{GE} = f(Q_G)$



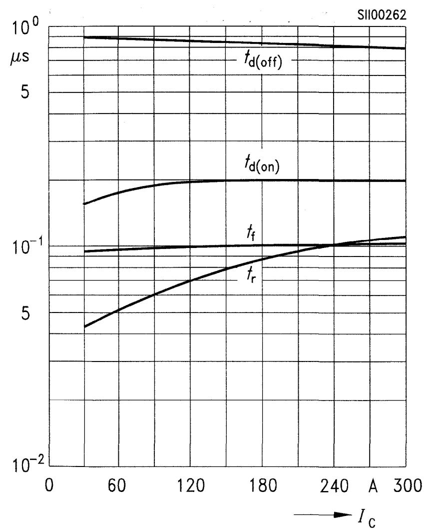
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Typ. switching time $t = f(R_G)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 300 A



Typ. switching time $t = f(I_C)$
Inductive load, parameter: T_j = 125 °C
V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 3.3 Ω



Package Outlines and Circuit Diagrams

Fig. 1
Weight: 150 g
Dimensions in mm

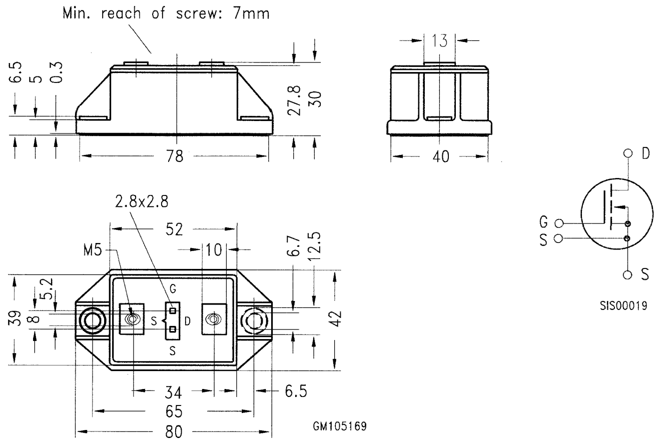
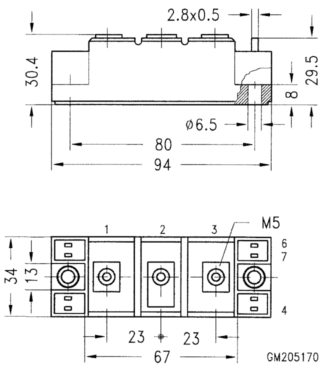


Fig. 2
Weight: 250 g
Dimensions in mm



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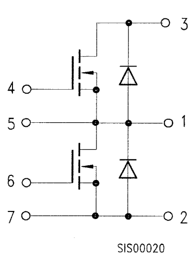

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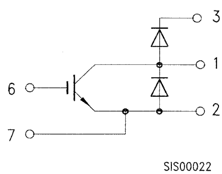


c

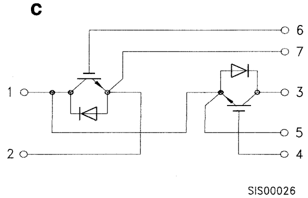
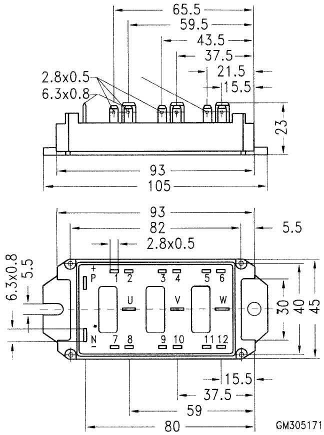


Fig. 3
Weight: 190 g
Dimensions in mm



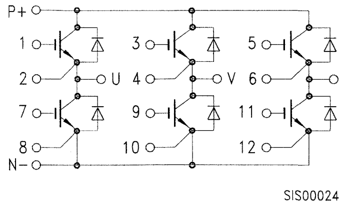
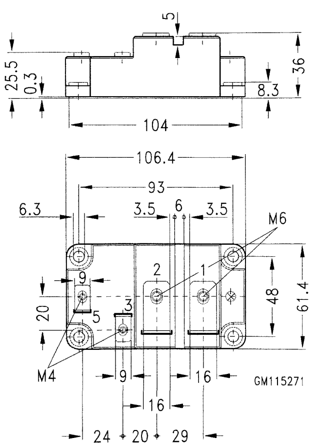


Fig. 4
Weight: 420 g
Dimensions in mm



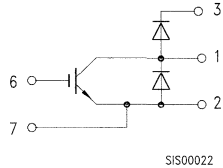
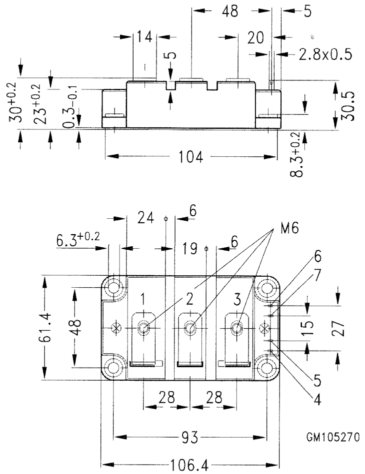


Fig. 5
Weight: 420 g
Dimensions in mm



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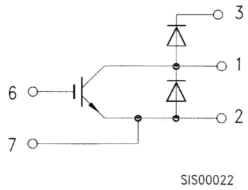

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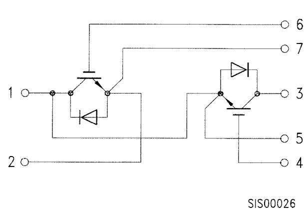
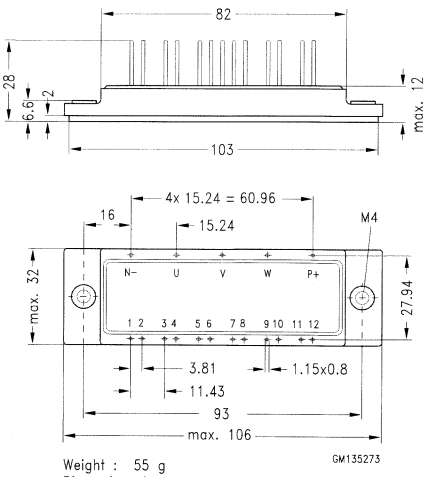
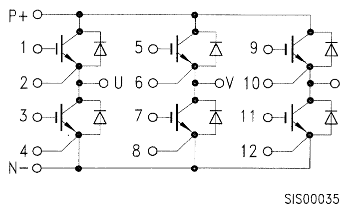


Fig. 6 (ECONOPACK)
Weight: 60 g
Dimensions in mm



Weight : 55 g
Dimensions in mm



Semiconductor Group-Addresses
Information on Literature

(A)
Siemens AG Österreich
Postfach 326
1031 Wien
☎ (01) 71711-5661
Tx 1372-10
FAX (01) 71711-5973

(AUS)
Siemens Ltd., Head Office
544 Church Street
Richmond (Melbourne), Vic. 3121
☎ (03) 4207111, Tx 30425
FAX (03) 4207275

(B)
Siemens S.A.
chaussée de Charleroi 116
1060 Bruxelles
☎ (02) 536-2111, Tx 21347
FAX (02) 536-2492

(BR)
ICOTRON S.A.
Indústria de Componentes
Eletrônicos
Avenida Mutinga, 3650-6º andar
05150 São Paulo-SP
☎ (011) 833-2211
Tx 11-81001
FAX (011) 831-4006

(CDN)
Siemens Electric Ltd.
Electronic Components Division
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☎ (416) 5641995
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(CH)
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(D)
Siemens AG
Salzufer 6–8
W-1000 Berlin 10
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Tx 17308196 sieznvb
FAX (030) 3993-2490
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Siemens AG
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FAX (0711) 2076-2448

(DK)
Siemens A/S
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☎ 44774477, Tx 1258222
FAX 44774017

(E)
Siemens S.A.
Departamento de Componentes
Orense, 2
Apartado 155
28020 Madrid
☎ (01) 5552500, Tx 44191
FAX (01) 5565408

(F)
Siemens S.A.
39/47, Bd. Ornano
93527 Saint-Denis CEDEX 2
☎ (1) 49223100, Tx 234077
FAX (1) 49223970

(GB)
Siemens plc
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Windmill Road
Sunbury on Thames
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FAX (0932) 752635

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(HK)
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Wanchai
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☎ 852/8330222
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(I)
Siemens S.p.A.
Div. Componenti, Impiante per
la Grafica e il Segnalamento
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Casella Postale 10388
20110 Milano
☎ (02) 6766-1, Tx 330261
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(IND)
Siemens Ltd.
Head Office
134-A, Dr. Annie Besant Road, Worli
P.O.B. 6597
Bombay 400018
☎ (022) 4938786, Tx 1175142
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(IRL)
Siemens Ltd.
Electronic Components Division
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☎ (01) 684727, Tx 93744
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(J)
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☎ (03) 3201-2401, Tx 32182
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(N)
Siemens A/S
Østre Aker vei 90
Postboks 10, Veitvet
0518 Oslo 5
☎ (02) 633000, Tx 78477
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(NL)
Siemens Nederland N.V.
Postb. 16068
2500 BB Den Haag
☎ (070) 3333333, Tx 31373
FAX (070) 3332790

(P)
Siemens S.A.
Estrada Nacional 117, Km 2,6
Alfragide
2700 Amadora
☎ (01) 4170011, Tx 62955
FAX (01) 4172870

(RC)
Tai Engineering Co., Ltd.
6th Fl., Central Building
108, Chung Shan North Road, Sec. 2
P.O. Box 68-1882
Taipei 10449
☎ (02) 5234700
Tx 27860 taiengco
FAX (02) 5367070

(ROK)
Siemens Ltd.
P.O.Box 3001
Seoul 100-391
☎ (02) 275-6111
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(S)
Siemens Components
Österögatan 1
Box 46
S-164 93 Kista
☎ (08) 7033500, Tx 11672
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(SF)
Siemens Oy
P.O.B 60
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☎ (0) 51051, Tx 124465
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(SGP)
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FAX 7770813, 7754504

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[1] Inhalt
- Durchflußwandler-SNT mit mehreren Ausgangsspannungen (5 V/10 A, ± 12 V/2A, TDA 4718 und SIPMOS)
- Schaltnetzteil mit neuer integrierter Schaltung TDA 4918 liefert 250 W
- Integrierte Steuerschaltung für freischwingende Sperrwandlernetzteile mit MOSFET als Leistungsschalter

[2] Contens
- Active harmonics filters with constant operating frequency and 600 W output power
- Switched-mode power supply with input voltage broadband using the TDA 4919 IC
- ± 80 V/± 5.0 A double (push-pull) flyback converter using the BUP 304 IGBT and the TDA 4915 push-pull SMPS IC

[1] Inhalt

- Tiefsetzsteller mit SIPMOS und TDA 4716 A
- DC/DC-Wandler von 12 V auf ± 25 V; 180 W mit SIPMOS BUZ 71A
- Schaltnetzteile für Eingangsspannungs-Weitbereich mit der integrierten Schaltung TDA 4919
- 20 kHz-Gegentaktnetzteil (SNT) mit IGBT BUP 304 und SNT-IC TDA 4918 für eine 36 V/ 400 W-Halogenlampe
- 3-Phasenumrichter, kurzschlußsicher mit FREDFET-Transistoren und Pulsweitenmodulator SLE 4520 (Motorsteuerung) ± 80 V/± 5.0 A Doppel (Push-Pull-)Sperrwandler mit IGBT BUP 304 und Gegentakt-SNT-IC TDA 4918
- Aktiver Oberschwingfilter mit konstanter Betriebsfrequenz und 600 W Ausgangsleistung
- 220-W-Schaltnetzteil mit Eintaktdurchflußwandler, Eingang: AC-Netz 220 V ± 20 %, Ausgang: 5 V/22 A; 12 V/8 A; -12 V/1 A
- 1000-W-SNT (30 V/33 A) mit IGBT BUP 304 und SNT-IC TDA 4918
- Schaltnetzteil in Current-Mode-Technik mit der integrierten Schaltung TDA 4919

[2] Contents

- Feed forward converter SMPS with several output voltages
- DC/DC converter from 12 V to ± 25 V/180 W using SIPMOS transistors BUZ 71A
- Buck converters using SIPMOS transistors and TDA 4716 A
- Switched-mode power supply with new IC gives TDA 4716 A
- TDA 4918 and TDA 4919 – new generation of control ICs for switched-mode power supplies

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Notes

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IGBT Modules

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