



SEMITRANS® 3

IGBT4 Modules

SKM400GB17E4

Features*

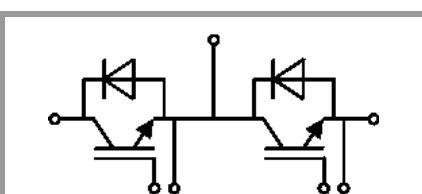
- IGBT4 = 4th generation medium fast trench IGBT (Infineon)
- CAL4 = Soft switching 4th generation CAL-Diode
- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
- With integrated Gate resistor
- For switching frequencies up to 8kHz
- UL recognized, file no. E63532

Typical Applications

- AC inverter drives
- UPS
- Electronic welders
- Public transport
- Wind power

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max.
- Recommended $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for $T_j = 150^\circ\text{C}$



GB

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1700	V
I _C	T _j = 175 °C	T _c = 25 °C	614	A
		T _c = 80 °C	474	A
I _{Cnom}			400	A
I _{CRM}	I _{CRM} = 3 x I _{Cnom}		1200	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 1000 V V _{GE} ≤ 15 V V _{CES} ≤ 1700 V	T _j = 150 °C	10	μs
T _j			-40 ... 175	°C
Inverse diode				
V _{RRM}	T _j = 25 °C		1700	V
I _F	T _j = 175 °C	T _c = 25 °C	443	A
		T _c = 80 °C	327	A
I _{Fnom}			400	A
I _{FRM}	I _{FRM} = 2 x I _{Fnom}		800	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		2340	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}			500	A
T _{stg}	module without TIM		-40 ... 125	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
V _{CE(sat)}	I _C = 400 A	T _j = 25 °C		1.92	2.20	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.30	2.60	V
V _{CE0}	chiplevel	T _j = 25 °C		0.80	0.90	V
		T _j = 150 °C		0.70	0.80	V
r _{CE}	V _{GE} = 15 V chiplevel	T _j = 25 °C		2.8	3.3	mΩ
		T _j = 150 °C		4.0	4.5	mΩ
V _{GE(th)}	V _{GE} =V _{CE} , I _C = 16 mA		5.2	5.8	6.4	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1700 V, T _j = 25 °C				5	mA
C _{ies}	V _{CE} = 25 V V _{GE} = 0 V	f = 1 MHz		36.0		nF
C _{oes}		f = 1 MHz		1.36		nF
C _{res}		f = 1 MHz		1.16		nF
Q _G	V _{GE} = - 8 V...+ 15 V			3200		nC
R _{Gint}	T _j = 25 °C			1.9		Ω
t _{d(on)}	V _{CC} = 1200 V	T _j = 150 °C		280		ns
t _r	I _C = 400 A	T _j = 150 °C		45		ns
E _{on}	V _{GE} = +15/-15 V	T _j = 150 °C		157		mJ
t _{d(off)}	R _{G on} = 2 Ω	T _j = 150 °C		760		ns
t _f	R _{G off} = 1 Ω	T _j = 150 °C		140		ns
	di/dt _{on} = 10000 A/ μs	T _j = 150 °C				
E _{off}	di/dt _{off} = 2300 A/μs dv/dt = 5600 V/μs	T _j = 150 °C		180		mJ
R _{th(j-c)}	per IGBT				0.066	K/W
R _{th(c-s)}	per IGBT (λ _{grease} =0.81 W/(m*K))			0.028		K/W
R _{th(c-s)}	per IGBT, pre-applied phase change material			0.017		K/W



SEMITRANS® 3

IGBT4 Modules

SKM400GB17E4

Features*

- IGBT4 = 4th generation medium fast trench IGBT (Infineon)
- CAL4 = Soft switching 4th generation CAL-Diode
- Insulated copper baseplate using DBC Technology (Direct Copper Bonding)
- With integrated Gate resistor
- For switching frequencies up to 8kHz
- UL recognized, file no. E63532

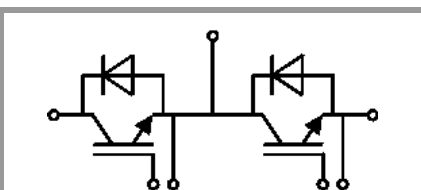
Typical Applications

- AC inverter drives
- UPS
- Electronic welders
- Public transport
- Wind power

Remarks

- Case temperature limited to $T_c = 125^\circ\text{C}$ max.
- Recommended $T_{op} = -40 \dots +150^\circ\text{C}$
- Product reliability results valid for $T_j = 150^\circ\text{C}$

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
V _F = V _{EC}	I _F = 400 A	T _j = 25 °C		2.00	2.40	V
	V _{GE} = 0 V	T _j = 150 °C		2.16	2.57	V
	chipllevel					
V _{F0}		T _j = 25 °C		1.32	1.56	V
	chipllevel	T _j = 150 °C		1.08	1.22	V
r _F		T _j = 25 °C		1.71	2.1	mΩ
	chipllevel	T _j = 150 °C		2.7	3.4	mΩ
I _{RRM}	I _F = 400 A	T _j = 150 °C		615		A
Q _{rr}	di/dt _{off} = 10100 A/μs	T _j = 150 °C		150		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 1200 V	T _j = 150 °C		130		mJ
R _{th(j-c)}	per diode				0.13	K/W
R _{th(c-s)}	per diode (λ _{grease} =0.81 W/(m*K))			0.038		K/W
R _{th(c-s)}	per diode, pre-applied phase change material			0.032		K/W
Module						
L _{CE}				15		nH
R _{CC'+EE'}	measured per	T _C = 25 °C		0.55		mΩ
	switch	T _C = 125 °C		0.85		mΩ
R _{th(c-s)1}	calculated without thermal coupling (λ _{grease} =0.81 W/(m*K))			0.0081		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module (λ _{grease} =0.81 W/(m*K))			0.013		K/W
R _{th(c-s)2}	including thermal coupling, T _s underneath module, pre-applied phase change material			0.009		K/W
M _s	to heat sink M6		3		5	Nm
M _t		to terminals M6	2.5		5	Nm
						Nm
w					325	g



GB

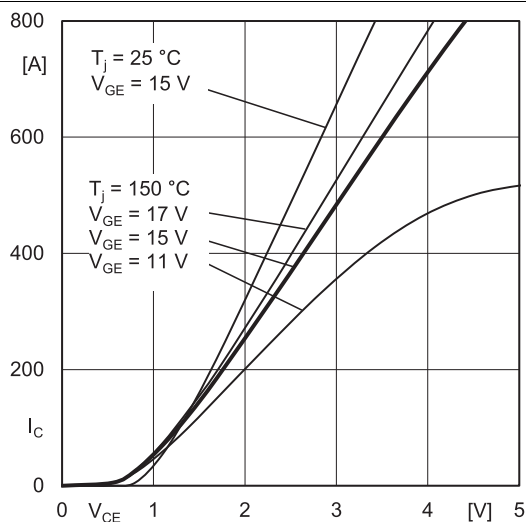


Fig. 1: Typ. output characteristic, inclusive $R_{CC} + EE'$

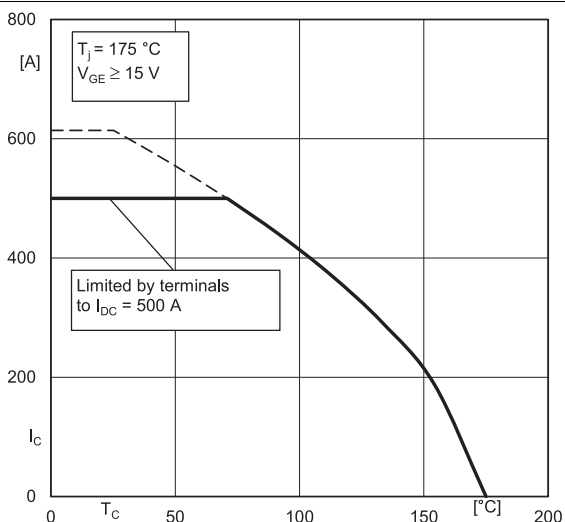


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

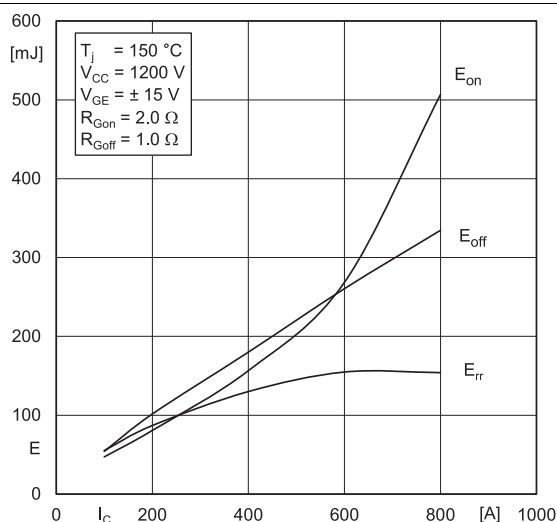


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

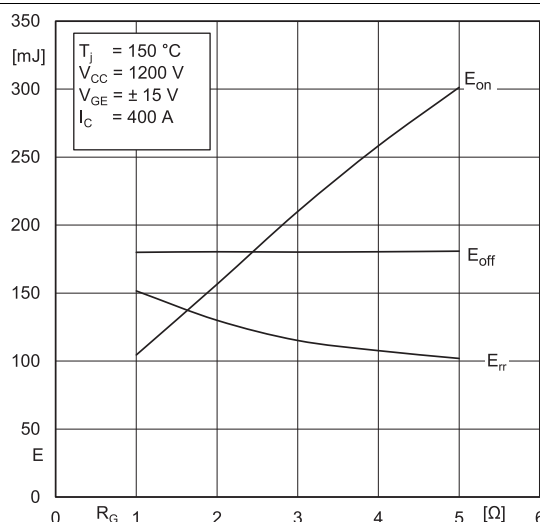


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

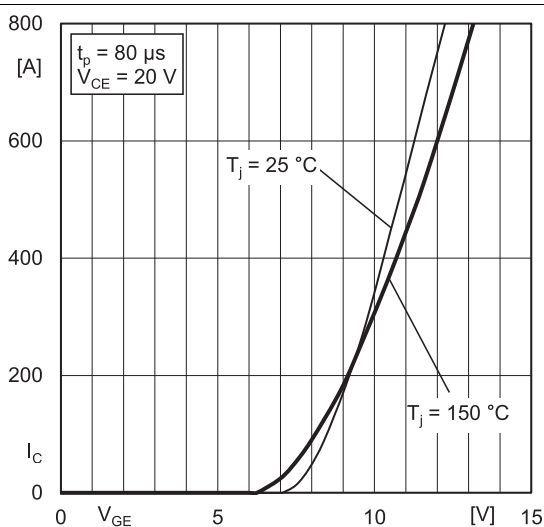


Fig. 5: Typ. transfer characteristic

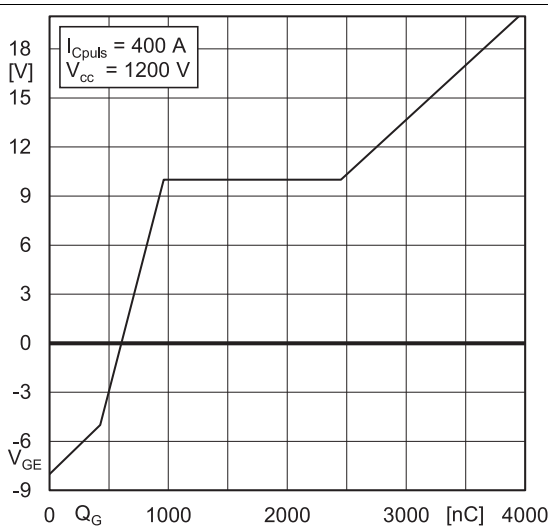


Fig. 6: Typ. gate charge characteristic

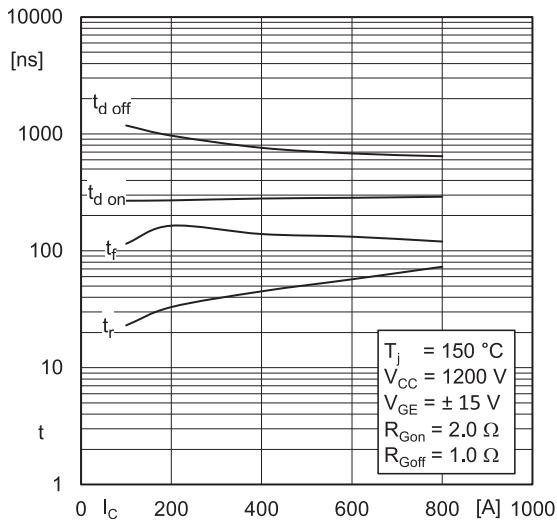


Fig. 7: Typ. switching times vs. I_C

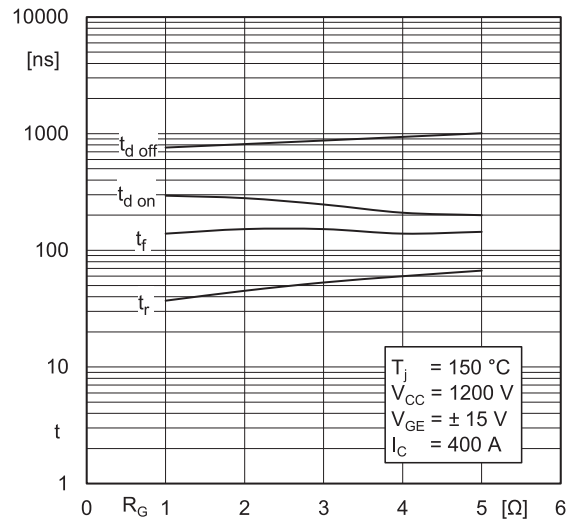


Fig. 8: Typ. switching times vs. gate resistor R_G

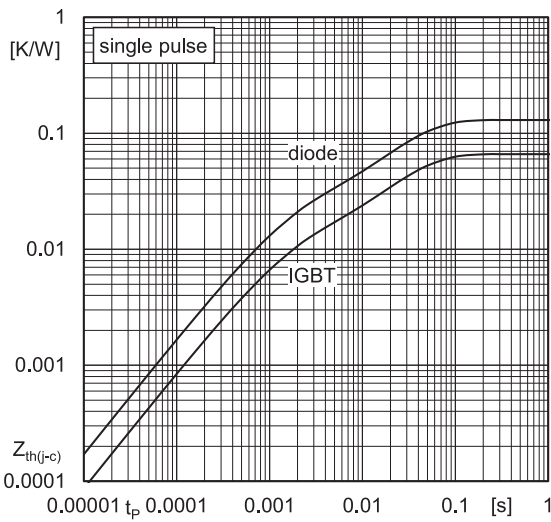


Fig. 9: Transient thermal impedance

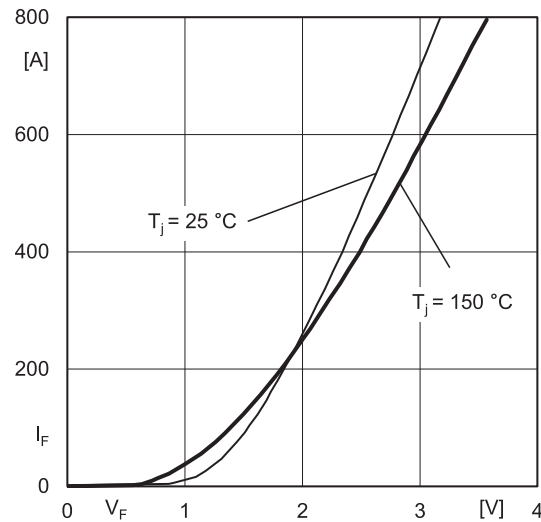


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC'+EE'}$

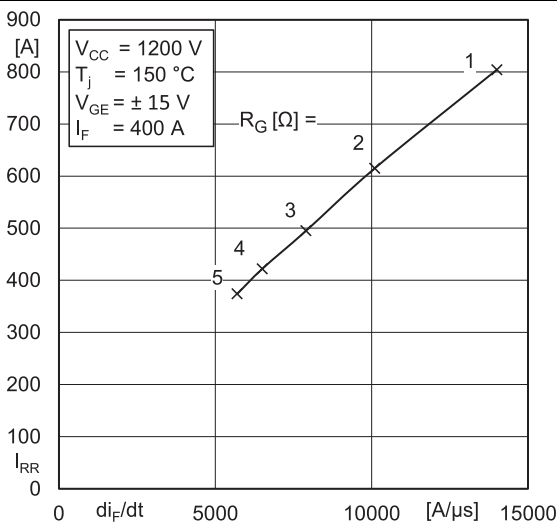


Fig. 11: Typ. CAL diode peak reverse recovery current

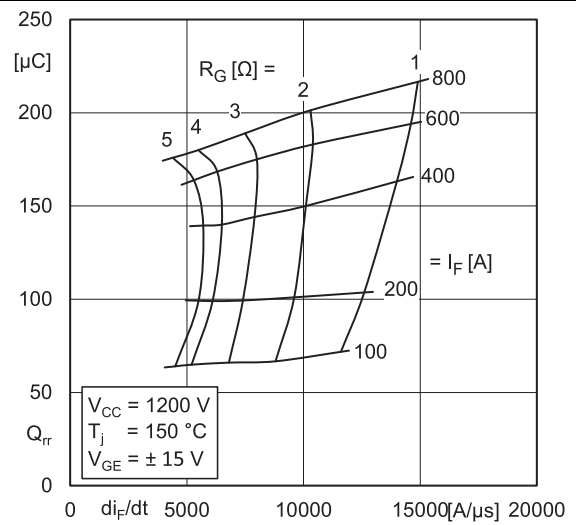
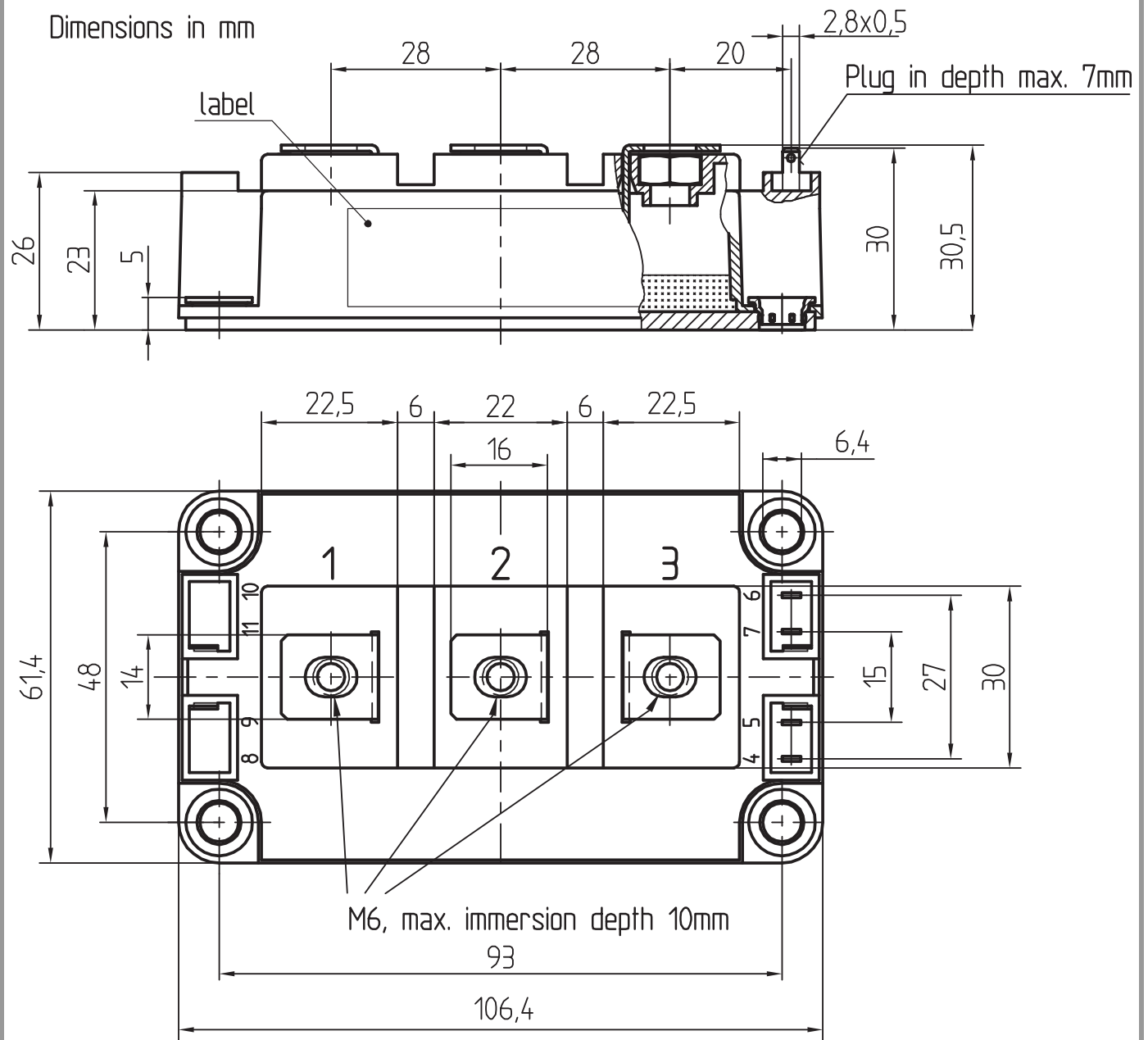
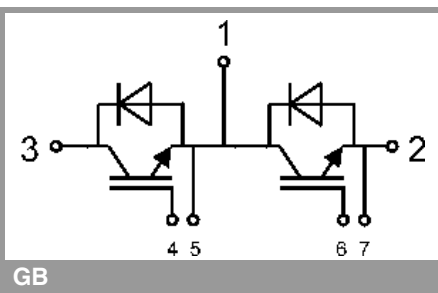


Fig. 12: Typ. CAL diode peak reverse recovery charge



General tolerance $\pm 0,5$ mm

SEMITRANS 3



This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

***IMPORTANT INFORMATION AND WARNINGS**

The specifications of SEMIKRON products may not be considered as guarantee or assurance of product characteristics ("Beschaffenheitsgarantie"). The specifications of SEMIKRON products describe only the usual characteristics of products to be expected in typical applications, which may still vary depending on the specific application. Therefore, products must be tested for the respective application in advance. Application adjustments may be necessary. The user of SEMIKRON products is responsible for the safety of their applications embedding SEMIKRON products and must take adequate safety measures to prevent the applications from causing a physical injury, fire or other problem if any of SEMIKRON products become faulty. The user is responsible to make sure that the application design is compliant with all applicable laws, regulations, norms and standards. Except as otherwise explicitly approved by SEMIKRON in a written document signed by authorized representatives of SEMIKRON, SEMIKRON products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury. No representation or warranty is given and no liability is assumed with respect to the accuracy, completeness and/or use of any information herein, including without limitation, warranties of non-infringement of intellectual property rights of any third party. SEMIKRON does not assume any liability arising out of the applications or use of any product; neither does it convey any license under its patent rights, copyrights, trade secrets or other intellectual property rights, nor the rights of others. SEMIKRON makes no representation or warranty of non-infringement or alleged non-infringement of intellectual property rights of any third party which may arise from applications. Due to technical requirements our products may contain dangerous substances. For information on the types in question please contact the nearest SEMIKRON sales office. This document supersedes and replaces all information previously supplied and may be superseded by updates. SEMIKRON reserves the right to make changes.