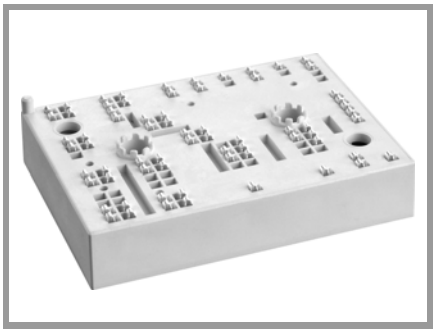
SKiiP 35NAB12T4V1



MiniSKiiP® 3

Converter-Inverter-Brake (CIB)

SKiiP 35NAB12T4V1

Features*

- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

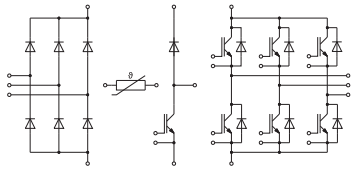
- Inverter up to 26 kVA
- Typical motor power 15 kW

Remarks

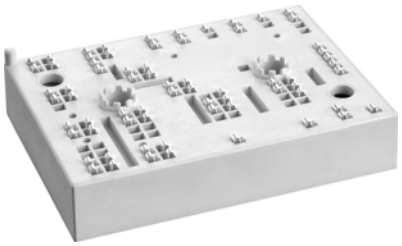
- Max. case temperature limited to T_C=125°C
- Product reliability results valid for T_j≤150°C (recommended $T_{j,op}$=-40...+150°C)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information

Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Inverter - IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	69	A
	T_j = 175 °C	T_s = 70 °C	55	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	77	A
	T_j = 175 °C	T_s = 70 °C	63	A
I_{Cnom}			50	A
I_{CRM}			150	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V V_{GE} ≤ 15 V V_{CES} ≤ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Chopper - IGBT				
V_{CES}	T_j = 25 °C		1200	V
I_C	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	68	A
	T_j = 175 °C	T_s = 70 °C	55	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	77	A
	T_j = 175 °C	T_s = 70 °C	63	A
I_{Cnom}			50	A
I_{CRM}			150	A
V_{GES}			-20 ... 20	V
t_{psc}	V_{CC} = 800 V V_{GE} ≤ 15 V V_{CES} ≤ 1200 V	T_j = 150 °C	10	µs
T_j			-40 ... 175	°C
Inverse - Diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	60	A
	T_j = 175 °C	T_s = 70 °C	48	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	68	A
	T_j = 175 °C	T_s = 70 °C	54	A
I_{FRM}			150	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		270	A
T_j			-40 ... 175	°C
Freewheeling - Diode				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	60	A
	T_j = 175 °C	T_s = 70 °C	48	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	68	A
	T_j = 175 °C	T_s = 70 °C	54	A
I_{FRM}			150	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		270	A
T_j			-40 ... 175	°C



NAB



MiniSKiiP® 3

Converter-Inverter-Brake (CIB)

SKiiP 35NAB12T4V1

Features*

- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- Inverter up to 26 kVA
- Typical motor power 15 kW

Remarks

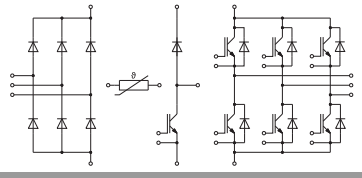
- Max. case temperature limited to T_C=125°C
- Product reliability results valid for T_j≤150°C (recommended $T_{j,op}$=-40...+150°C)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information

Absolute Maximum Ratings

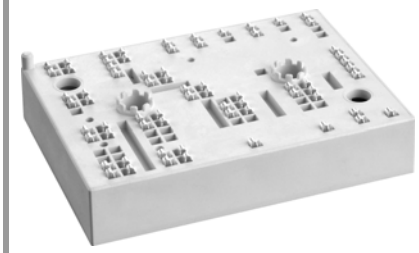
Symbol	Conditions		Values	Unit
Rectifier - Diode				
V_{RRM}	T_j = 25 °C		1600	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	81	A
	T_j = 150 °C	T_s = 70 °C	60	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	92	A
	T_j = 150 °C	T_s = 70 °C	68	A
I_{FSM}	t_p = 10 ms	T_j = 25 °C	700	A
	sin 180°	T_j = 150 °C	490	A
i^2t	t_p = 10 ms	T_j = 25 °C	2500	A^2s
	sin 180°	T_j = 150 °C	1200	A^2s
T_j			-40 ... 150	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C, 20 A per spring		80	A
T_{stg}	module without TIM		-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, 1 min		2500	V

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
$V_{CE(sat)}$	I_C = 50 A	T_j = 25 °C		1.85	2.10	V
	V_{GE} = 15 V chiplevel	T_j = 150 °C		2.20	2.40	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	T_j = 25 °C		21	24	mΩ
	chiplevel	T_j = 150 °C		30	32	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 2 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				1	mA
C_{ies}	V_{CE} = 25 V	f = 1 MHz		2.77		nF
C_{oes}	V_{GE} = 0 V	f = 1 MHz		0.21		nF
C_{res}		f = 1 MHz		0.16		nF
Q_G	V_{GE} = - 8 V...+ 15 V			280		nC
R_{Gint}	T_j = 25 °C			4.0		Ω
$t_{d(on)}$	V_{CC} = 600 V	T_j = 150 °C		60		ns
t_r	I_C = 50 A	T_j = 150 °C		35		ns
E_{on}	$R_{G\ on}$ = 15 Ω	T_j = 150 °C		6		mJ
$t_{d(off)}$	$R_{G\ off}$ = 15 Ω di/dt_{on} = 1700 A/µs	T_j = 150 °C		370		ns
t_f	di/dt_{off} = 650 A/µs	T_j = 150 °C		60		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		4.7		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.71		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.57		K/W



NAB



MiniSKiiP® 3

Converter-Inverter-Brake (CIB)

SKiiP 35NAB12T4V1

Features*

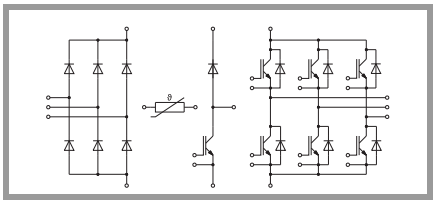
- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- Inverter up to 26 kVA
- Typical motor power 15 kW

Remarks

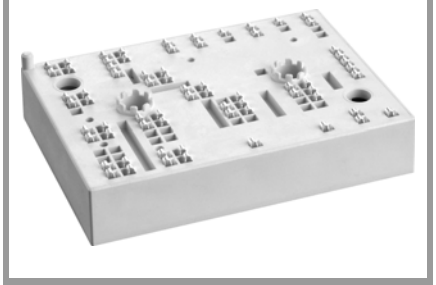
- Max. case temperature limited to T_C=125°C
- Product reliability results valid for T_j≤150°C (recommended $T_{j,op}$=-40...+150°C)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information



NAB

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
$V_{CE(sat)}$	I_C = 50 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.20	2.40	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		21	24	mΩ
		T_j = 150 °C		30	32	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 2 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V, T_j = 25 °C				1	mA
C_{ies}	V_{CE} = 25 V V_{GE} = 0 V	f = 1 MHz		2.77		nF
C_{oes}		f = 1 MHz		0.21		nF
C_{res}		f = 1 MHz		0.16		nF
Q_G	V_{GE} = - 8 V...+ 15 V			280		nC
R_{Gint}	T_j = 25 °C			4.0		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 50 A $R_{G\ on}$ = 15 Ω $R_{G\ off}$ = 15 Ω	T_j = 150 °C		60		ns
t_r		T_j = 150 °C		35		ns
E_{on}		T_j = 150 °C		6		mJ
$t_{d(off)}$		T_j = 150 °C		370		ns
t_f		T_j = 150 °C		60		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		4.7		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.71		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.57		K/W
Inverse - Diode						
$V_F = V_{EC}$	I_F = 50 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.22	2.54	V
		T_j = 150 °C		2.18	2.50	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		18	21	mΩ
		T_j = 150 °C		26	28	mΩ
I_{RRM}	I_F = 50 A di/dt_{off} = 1400 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		45		A
Q_{rr}		T_j = 150 °C		8.6		µC
E_{rr}		T_j = 150 °C		3.4		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.95		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.79		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	I_F = 50 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.22	2.54	V
		T_j = 150 °C		2.18	2.50	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		18	21	mΩ
		T_j = 150 °C		26	28	mΩ
I_{RRM}	I_F = 50 A di/dt_{off} = 1400 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		45		A
Q_{rr}		T_j = 150 °C		8.6		µC
E_{rr}		T_j = 150 °C		3.4		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.95		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.79		K/W



MiniSKiiP® 3

Converter-Inverter-Brake (CIB)

SKiiP 35NAB12T4V1

Features*

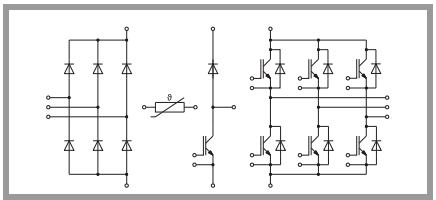
- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- Inverter up to 26 kVA
- Typical motor power 15 kW

Remarks

- Max. case temperature limited to T_C=125°C
- Product reliability results valid for T_j≤150°C (recommended $T_{j,op}$=-40...+150°C)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information



NAB

Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
$V_F = V_{EC}$	I_F = 25 A chiplevel	T_j = 25 °C		1.00	1.21	V
		T_j = 125 °C		0.90	1.10	V
V_{F0}	chiplevel	T_j = 25 °C		0.88	0.98	V
		T_j = 125 °C		0.73	0.83	V
r_F	chiplevel	T_j = 25 °C		4.8	9.2	mΩ
		T_j = 125 °C		6.8	11	mΩ
I_R	T_j = 145 °C, V_{RRM}				1.1	mA
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			0.9		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			0.75		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w				82		g
L_{CE}				-		nH
Temperature Sensor						
R_{100}	T_r=100°C (R_{25}=1000Ω)			1670 ± 3%		Ω
$R_{(T)}$	$R_{(T)}$=1000Ω[1+A(T-25°C)+B(T-25°C)^2] , A = 7.635*10^{-3}°C^{-1}, B = 1.731*10^{-5}°C^{-2}					

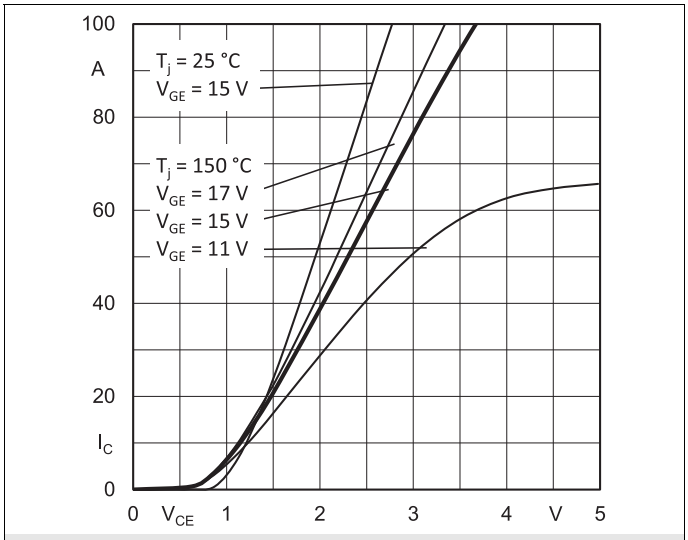


Fig. 1: Typ. output characteristic

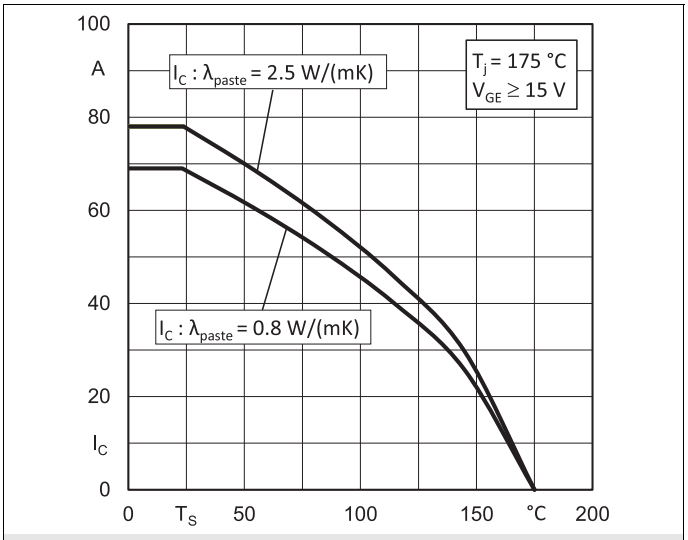


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_S)$

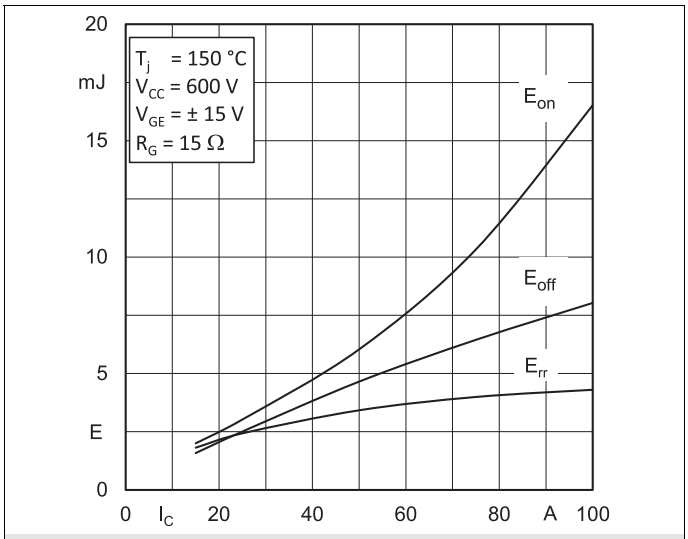


Fig. 3: Typ. turn-on /-off energy = f (I_C)

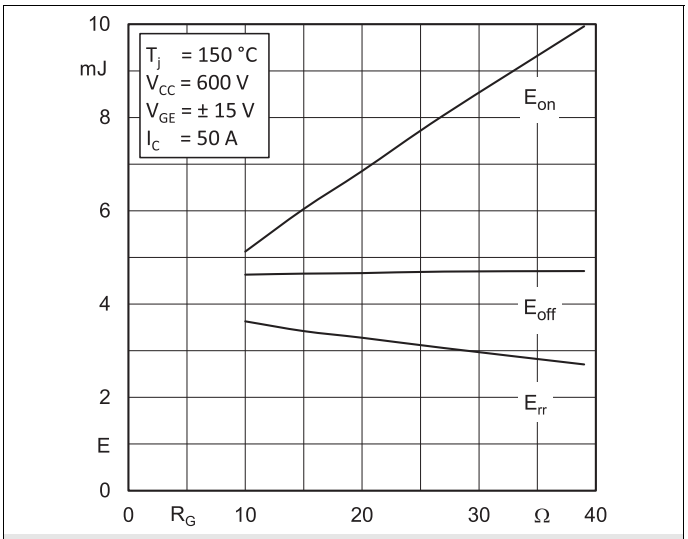


Fig. 4: Typ. turn-on /-off energy = f (R_G)

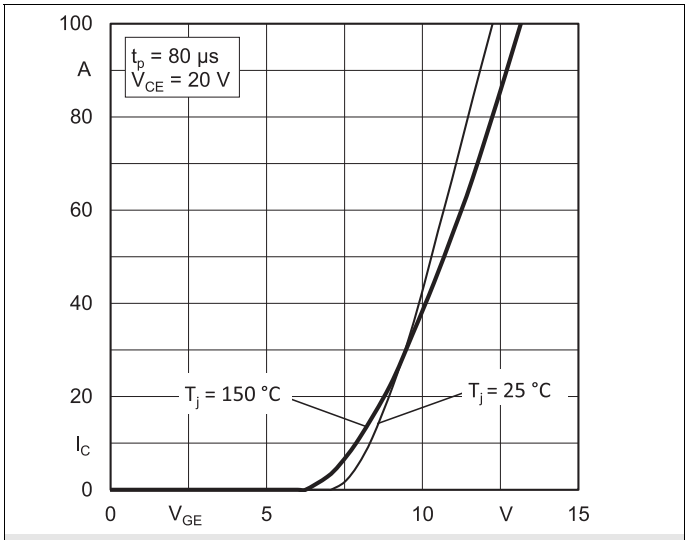


Fig. 5: Typ. transfer characteristic

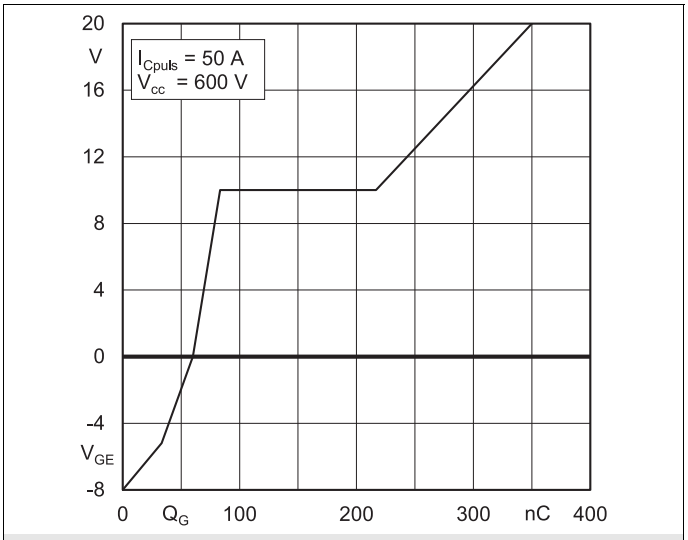


Fig. 6: Typ. gate charge characteristic

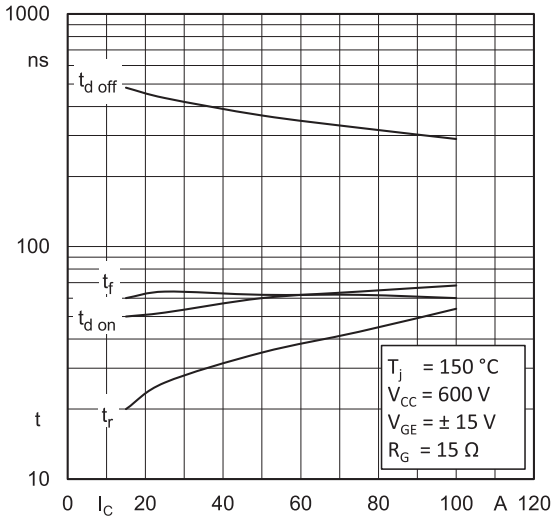


Fig. 7: Typ. switching times vs. I_C

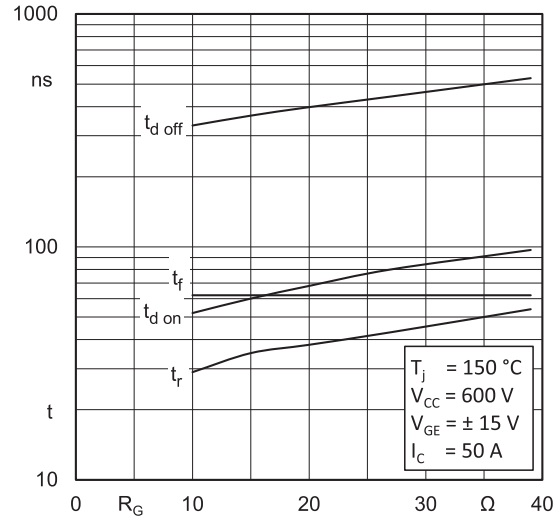


Fig. 8: Typ. switching times vs. gate resistor R_G

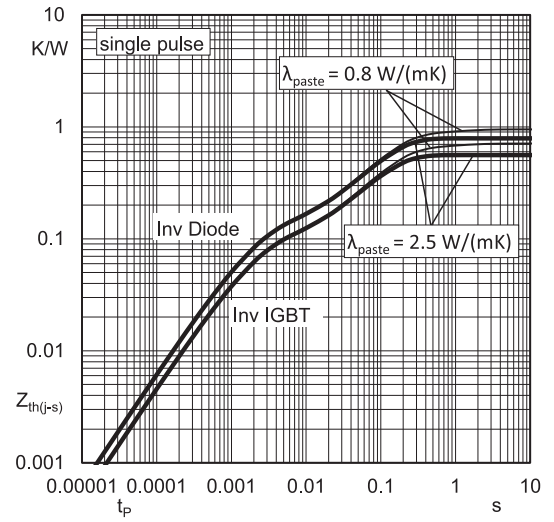


Fig. 9: Typ. transient thermal impedance

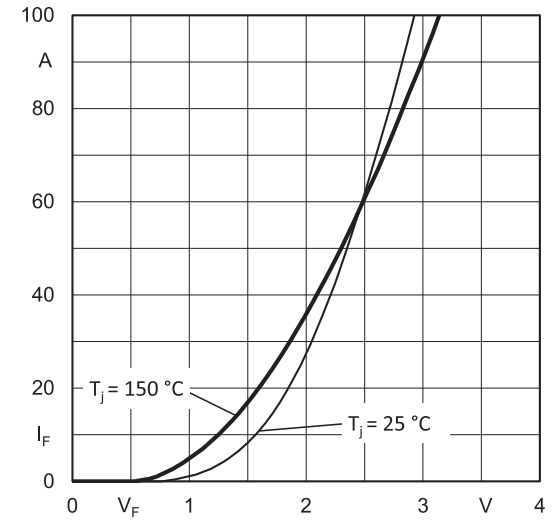


Fig. 10: Typ. CAL diode forward characteristic

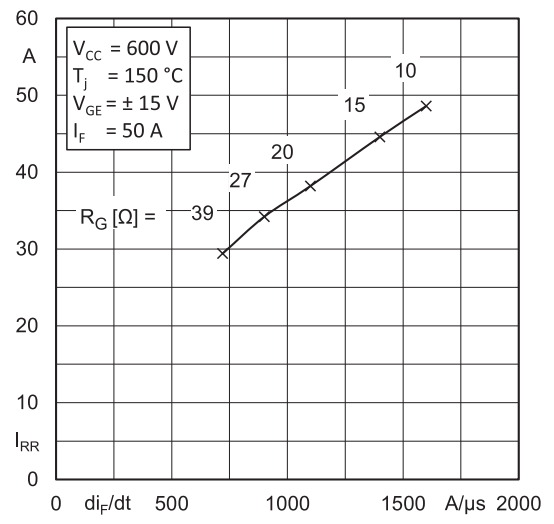


Fig. 11: Typ. CAL diode peak reverse recovery current

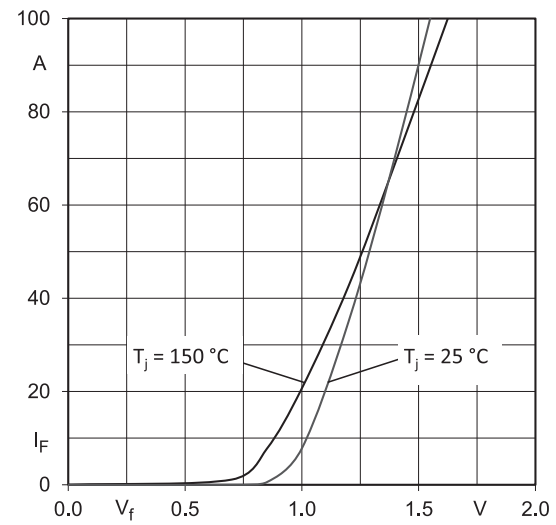
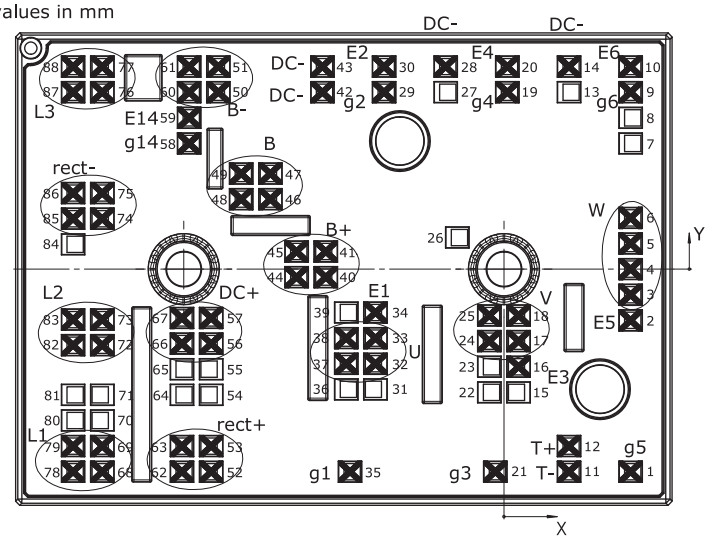


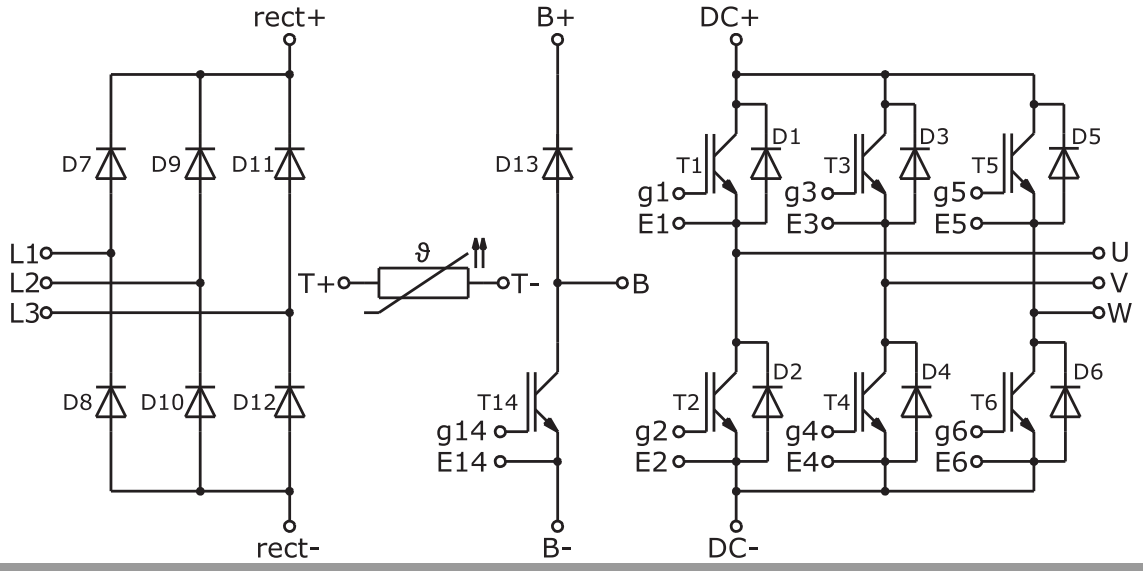
Fig. 12: Typ. input bridge forward characteristic

Pin out											
Pin	*X*	*Y*	*Function*	*Pin*	*X*	*Y*	*Function*	*Pin*	*X*	*Y*	*Function*
1	15,83	-25,30	g5	31	-16,05	-15,02		61	-39,33	25,30	B-
2	15,83	-6,40	E5	32	-16,05	-11,82	U	62	-40,23	-25,30	rect+
3	15,83	-3,20	W	33	-16,05	-8,62	U	63	-40,23	-22,10	rect+
4	15,83	0	W	34	-16,05	-5,42	E1	64	-40,23	-15,70	
5	15,83	3,20	W	35	-19,23	-25,30	g1	65	-40,23	-12,50	
6	15,83	6,40	W	36	-19,70	-15,02		66	-40,23	-9,30	DC+
7	15,83	15,70		37	-19,70	-11,82	U	67	-40,23	-6,10	DC+
8	15,83	18,90		38	-19,70	-8,62	U	68	-50,18	-25,30	L1
9	15,83	22,10	g6	39	-19,70	-5,42		69	-50,18	-22,10	L1
10	15,83	25,30	E6	40	-22,26	-1,00	B+	70	-50,18	-18,90	
11	8,13	-25,30	T-	41	-22,26	2,20	B+	71	-50,18	-15,70	
12	8,13	-22,10	T+	42	-22,68	22,10	DC-	72	-50,18	-9,50	L2
13	8,13	22,10		43	-22,68	25,30	DC-	73	-50,18	-6,30	L2
14	8,13	25,30	DC-	44	-25,91	-1,00	B+	74	-50,18	6,30	rect-
15	1,83	-15,39		45	-25,91	2,20	B+	75	-50,18	9,50	rect-
16	1,83	-12,19	E3	46	-29,18	8,74	B	76	-50,18	22,10	L3
17	1,83	-8,99	V	47	-29,18	11,94	B	77	-50,18	25,30	L3
18	1,83	-5,79	V	48	-32,83	8,74	B	78	-53,83	-25,30	L1
19	0,43	22,10	g4	49	-32,83	11,94	B	79	-53,83	-22,10	L1
20	0,43	25,30	E4	50	-35,68	22,10	B-	80	-53,83	-18,90	
21	-1,08	-25,30	g3	51	-35,68	25,30	B-	81	-53,83	-15,70	
22	-1,83	-15,39		52	-36,58	-25,30	rect+	82	-53,83	-9,50	L2
23	-1,83	-12,19		53	-36,58	-22,10	rect+	83	-53,83	-6,30	L2
24	-1,83	-8,99	V	54	-36,58	-15,70		84	-53,83	3,10	
25	-1,83	-5,79	V	55	-36,58	-12,50		85	-53,83	6,30	rect-
26	-5,83	3,95		56	-36,58	-9,30	DC+	86	-53,83	9,50	rect-
27	-7,28	22,10		57	-36,58	-6,10	DC+	87	-53,83	22,10	L3
28	-7,28	25,30	DC-	58	-39,33	15,70	g14	88	-53,83	25,30	L3
29	-14,98	22,10	g2	59	-39,33	18,90	E14				
30	-14,98	25,30	E2	60	-39,33	22,10	B-				

all values in mm



Pinout and Dimensions



Pinout

This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

***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.

