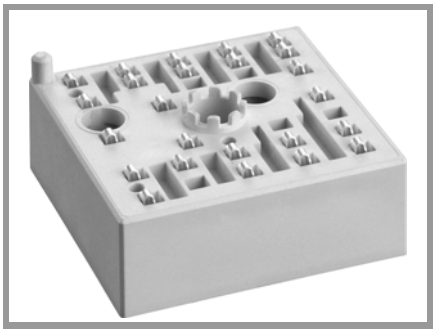
SKiiP 11NAB12T4V1



MiniSKiiP® 1

Converter-Inverter-Brake (CIB)

SKiiP 11NAB12T4V1

Features*

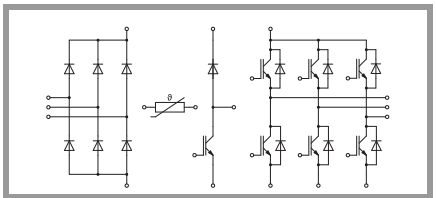
- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- Inverter up to 8 kVA
- Typical motor power 4 kW

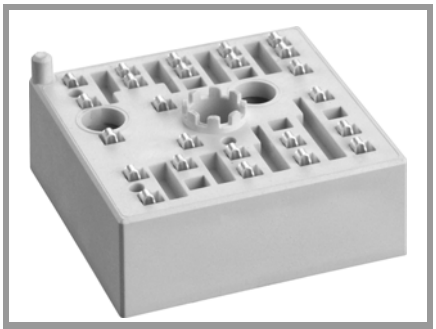
Remarks

- 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

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_j = 175 °C	T_s = 25 °C	18	A
		T_s = 70 °C	14	A
I_C	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	19	A
		T_s = 70 °C	16	A
I_{Cnom}			8	A
I_{CRM}			24	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_j = 175 °C	T_s = 25 °C	18	A
		T_s = 70 °C	14	A
I_C	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	19	A
		T_s = 70 °C	16	A
I_{Cnom}			8	A
I_{CRM}			24	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_j = 175 °C	T_s = 25 °C	15	A
		T_s = 70 °C	12	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	17	A
		T_s = 70 °C	13	A
I_{FRM}			24	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		36	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_j = 175 °C	T_s = 25 °C	15	A
		T_s = 70 °C	12	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 175 °C	T_s = 25 °C	17	A
		T_s = 70 °C	13	A
I_{FRM}			24	A
I_{FSM}	t_p = 10 ms, sin 180°, T_j = 150 °C		36	A
T_j			-40 ... 175	°C



MiniSKiiP® 1

Converter-Inverter-Brake (CIB)

SKiiP 11NAB12T4V1

Features*

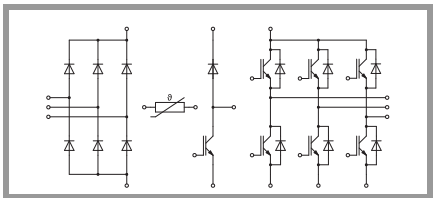
- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- Inverter up to 8 kVA
- Typical motor power 4 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

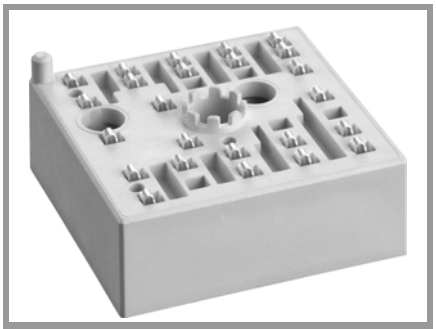


NAB

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_j = 150 °C	T_s = 25 °C	39	A
		T_s = 70 °C	29	A
I_F	λ_{paste}=2.5 W/(mK) T_j = 150 °C	T_s = 25 °C	42	A
		T_s = 70 °C	32	A
I_{FSM}	t_p = 10 ms sin 180°	T_j = 25 °C	220	A
		T_j = 150 °C	200	A
i^2t	t_p = 10 ms sin 180°	T_j = 25 °C	242	A^2s
		T_j = 150 °C	200	A^2s
T_j			-40 ... 150	°C
Module				
$I_{t(RMS)}$	$T_{terminal}$ = 80 °C,		12	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 = 8 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.25	2.45	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		131	150	mΩ
		T_j = 150 °C		194	206	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1 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		0.49		nF
C_{oes}		f = 1 MHz		0.05		nF
C_{res}		f = 1 MHz		0.03		nF
Q_G	V_{GE} = - 8 V...+ 15 V			45		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 8 A $R_{G\ on}$ = 47 Ω $R_{G\ off}$ = 47 Ω	T_j = 150 °C		31		ns
t_r		T_j = 150 °C		31		ns
E_{on}		T_j = 150 °C		0.87		mJ
$t_{d(off)}$		T_j = 150 °C		290		ns
t_f		T_j = 150 °C		70		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		0.74		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			1.84		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			1.58		K/W

 © by SEMIKRON



MiniSKiiP® 1

Converter-Inverter-Brake (CIB)

SKiiP 11NAB12T4V1

Features*

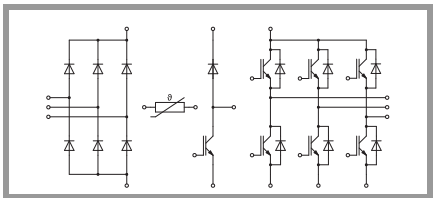
- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- Inverter up to 8 kVA
- Typical motor power 4 kW

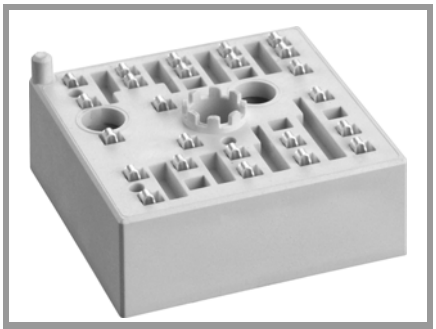
Remarks

- 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 = 8 A V_{GE} = 15 V chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.25	2.45	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		131	150	mΩ
		T_j = 150 °C		194	206	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1 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		0.49		nF
C_{oes}		f = 1 MHz		0.05		nF
C_{res}		f = 1 MHz		0.03		nF
Q_G	V_{GE} = - 8 V...+ 15 V			45		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 600 V I_C = 8 A $R_{G\ on}$ = 47 Ω $R_{G\ off}$ = 47 Ω	T_j = 150 °C		31		ns
t_r		T_j = 150 °C		31		ns
E_{on}		T_j = 150 °C		0.87		mJ
$t_{d(off)}$		T_j = 150 °C		290		ns
t_f		T_j = 150 °C		70		ns
E_{off}	V_{GE} = +15/-15 V	T_j = 150 °C		0.74		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			1.84		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			1.58		K/W
Inverse - Diode						
$V_F = V_{EC}$	I_F = 8 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.33	2.65	V
		T_j = 150 °C		2.35	2.68	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		129	144	mΩ
		T_j = 150 °C		181	198	mΩ
I_{RRM}	I_F = 8 A di/dt_{off} = 380 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		8.3		A
Q_{rr}		T_j = 150 °C		1.35		µC
E_{rr}		T_j = 150 °C		0.57		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			2.53		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			2.2		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	I_F = 8 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.33	2.65	V
		T_j = 150 °C		2.35	2.68	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		129	144	mΩ
		T_j = 150 °C		181	198	mΩ
I_{RRM}	I_F = 8 A di/dt_{off} = 380 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		8.3		A
Q_{rr}		T_j = 150 °C		1.35		µC
E_{rr}		T_j = 150 °C		0.57		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			2.53		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			2.2		K/W



MiniSKiiP® 1

Converter-Inverter-Brake (CIB)

SKiiP 11NAB12T4V1

Features*

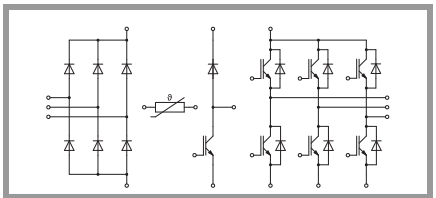
- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- Inverter up to 8 kVA
- Typical motor power 4 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 = 8 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		15	29	mΩ
		T_j = 125 °C		21	34	mΩ
I_R	T_j = 145 °C, V_{RRM}				1.1	mA
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.5		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			1.29		K/W
Module						
M_s	to heat sink		2		2.5	Nm
w				30		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}					

 © by SEMIKRON

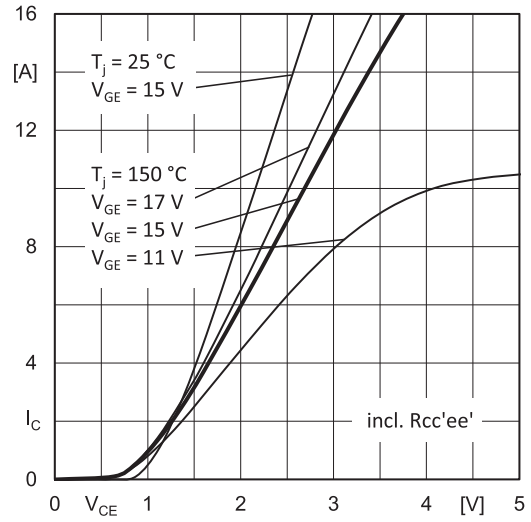


Fig. 1: Typ. output characteristic

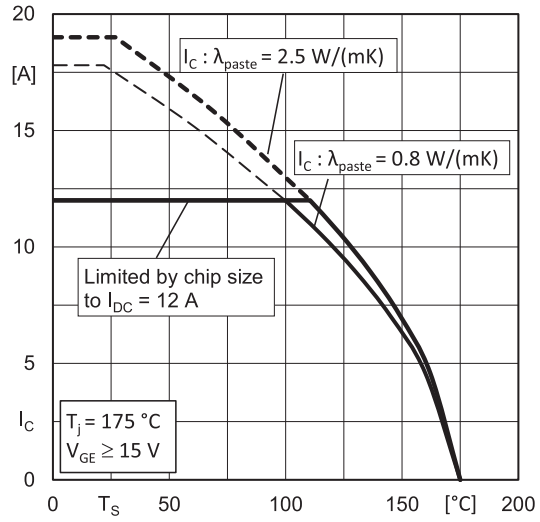


Fig. 2: Typ. rated current vs. temperature Ic = f(Ts)

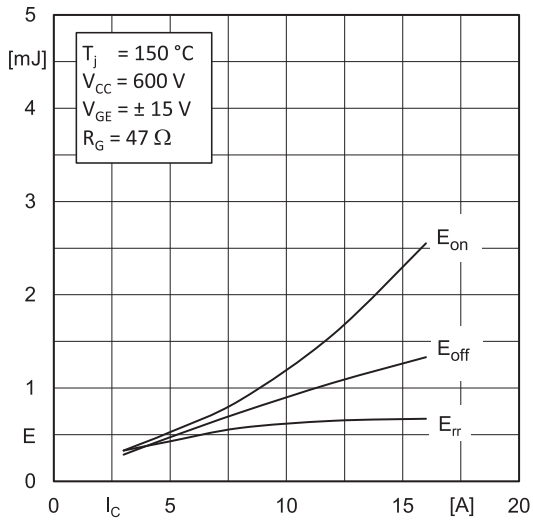


Fig. 3: Typ. turn-on /-off energy = f (I_C)

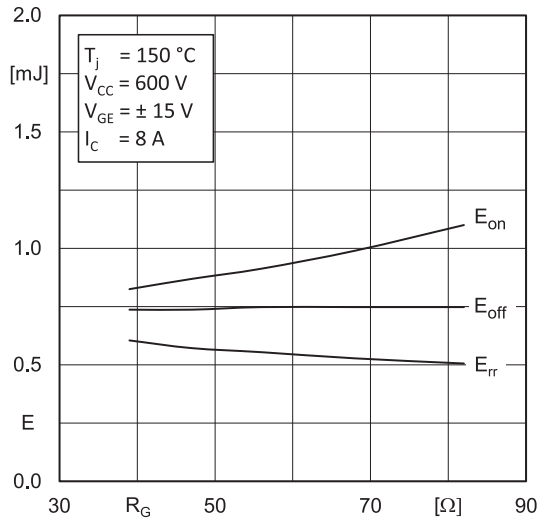


Fig. 4: Typ. turn-on /-off energy = f (R_G)

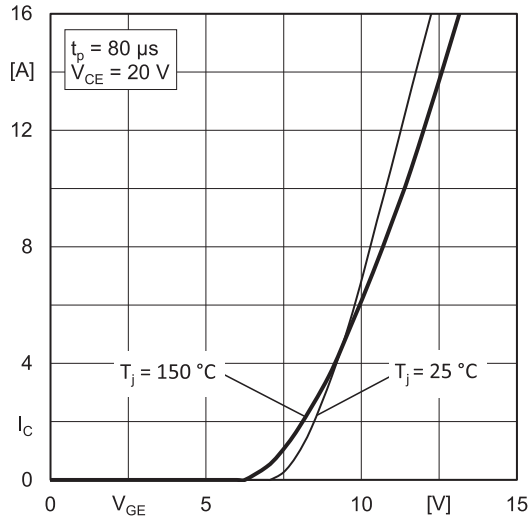


Fig. 5: Typ. transfer characteristic

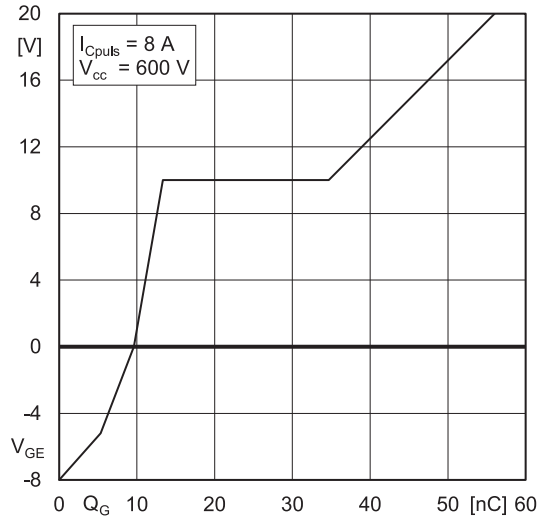


Fig. 6: Typ. gate charge characteristic

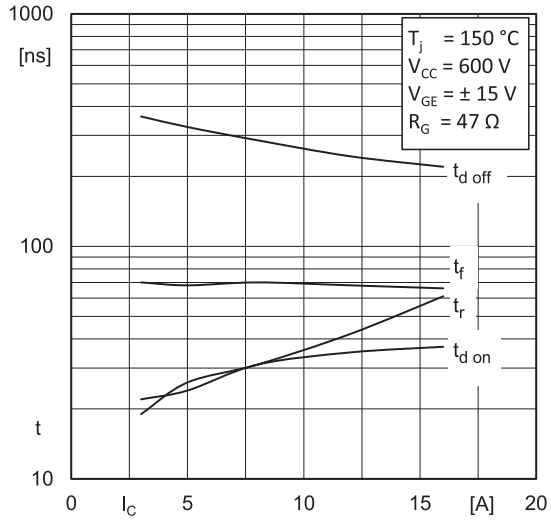


Fig. 7: Typ. switching times vs. I_C

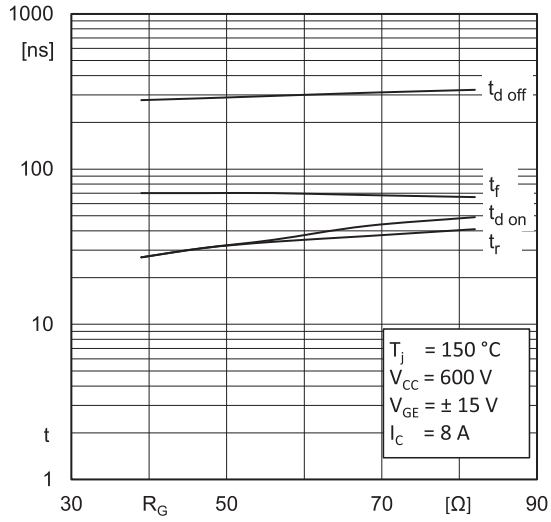


Fig. 8: Typ. switching times vs. gate resistor R_G

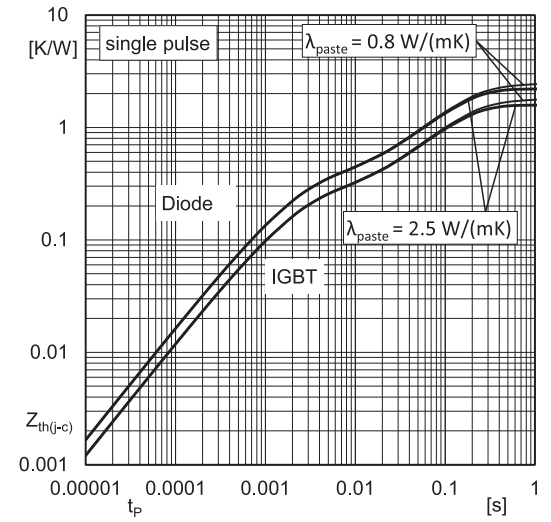


Fig. 9: Typ. transient thermal impedance

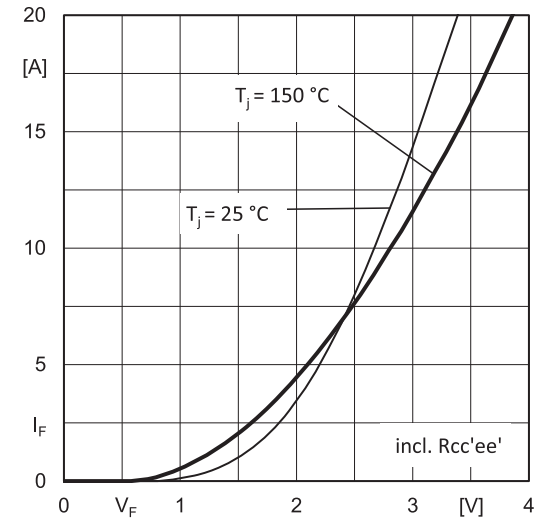


Fig. 10: Typ. CAL diode forward characteristic

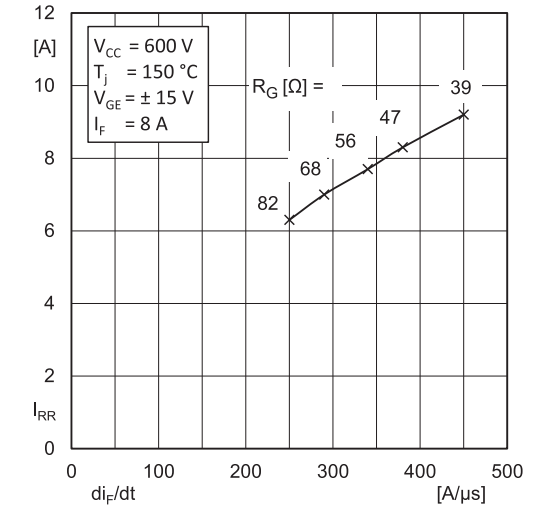


Fig. 11: Typ. CAL diode peak reverse recovery current

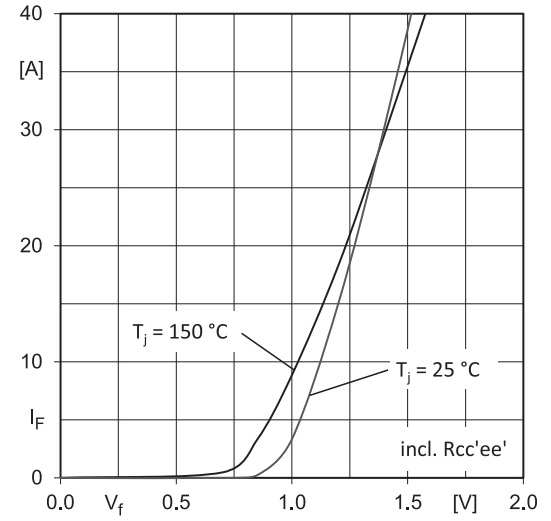
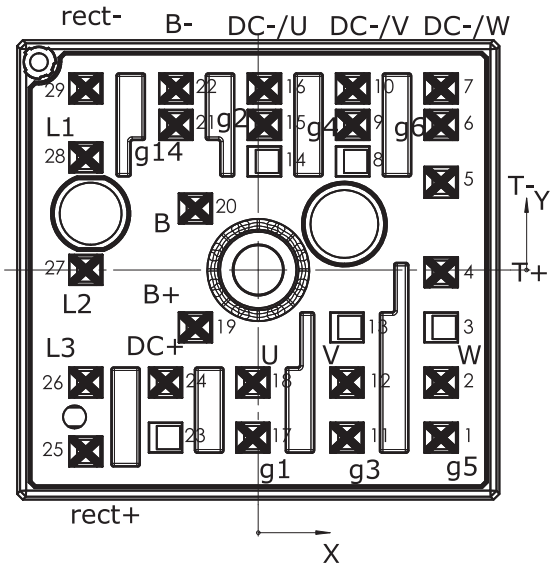


Fig. 12: Typ. input bridge forward characteristic

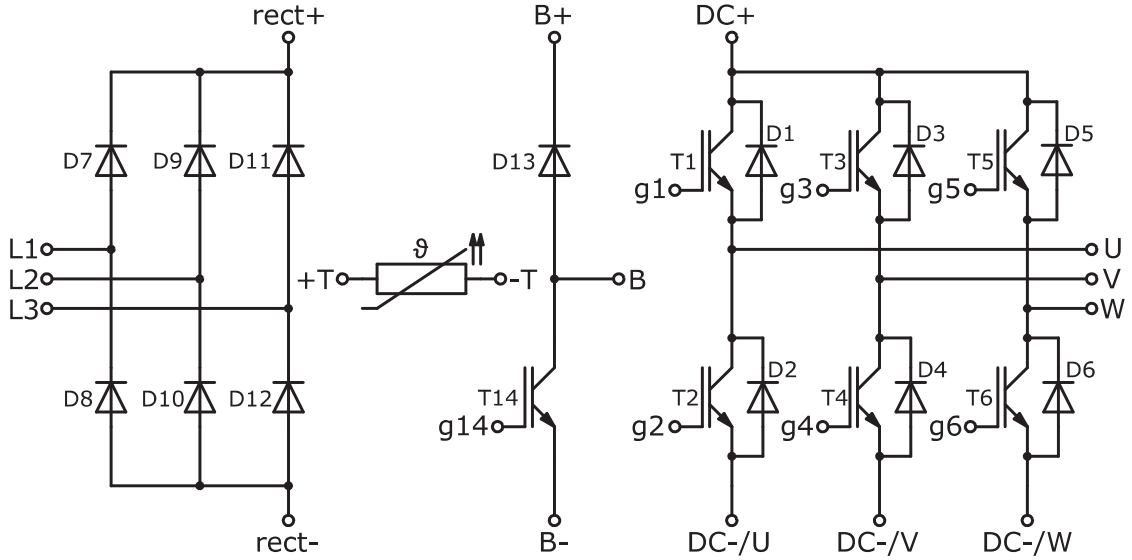
 © by SEMIKRON

Pin out							
Pin	*X*	*Y*	*Function*	*Pin*	*X*	*Y*	*Function*
1	15,93	-14,60	g5	16	0,53	15,80	DC-/U
2	15,93	-9,80	W	17	-0,48	-14,6	g1
3	15,93	-5,00		18	-0,48	-9,80	U
4	15,93	-0,20	T+	19	-5,48	-5,00	B+
5	15,93	7,63	T-	20	-5,48	5,35	B
6	15,93	12,63	g6	21	-7,18	12,63	g14
7	15,93	15,80	DC-/W	22	-7,18	15,80	B-
8	8,23	9,45		23	-8,08	-14,60	
9	8,23	12,63	g4	24	-8,08	-9,80	DC+
10	8,23	15,80	DC-/V	25	-15,03	-15,80	rect+
11	7,73	-14,60	g3	26	-15,03	-9,80	L3
12	7,73	-9,80	V	27	-15,03	0	L2
13	7,73	-5,00		28	-15,03	9,80	L1
14	0,53	9,45		29	-15,03	15,80	rect-
15	0,53	12,63	g2				

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.

 © by SEMIKRON