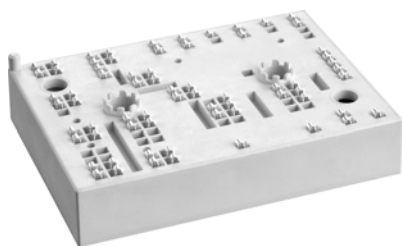


SKiiP 35NAB12T4V1



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

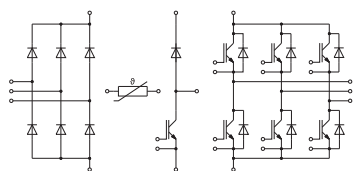
Typical Applications

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

Remarks

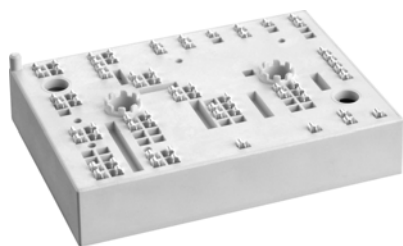
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents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



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Typical Applications

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- Typical motor power 15 kW

Remarks

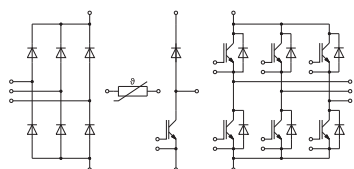
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
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Absolute Maximum Ratings

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

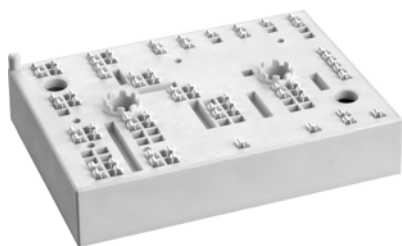
Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 50 \text{ A}$ $V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.20	2.40	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V
		$T_j = 150^\circ\text{C}$	0.70	0.80	V
r_{CE}	$V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	21	24	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	30	32	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 2 \text{ mA}$	5	5.8	6.5	V
I_{CES}	$V_{GE} = 0 \text{ V}$, $V_{CE} = 1200 \text{ V}$, $T_j = 25^\circ\text{C}$			1	mA
C_{ies}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	2.77		nF
C_{oes}		$f = 1 \text{ MHz}$	0.21		nF
C_{res}		$f = 1 \text{ MHz}$	0.16		nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		280		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		4.0		Ω
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$ $I_C = 50 \text{ A}$	$T_j = 150^\circ\text{C}$	60		ns
t_r	$R_{G on} = 15 \Omega$	$T_j = 150^\circ\text{C}$	35		ns
E_{on}	$R_{G off} = 15 \Omega$	$T_j = 150^\circ\text{C}$	6		mJ
$t_{d(off)}$	$di/dt_{on} = 1700 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	370		ns
t_f	$di/dt_{off} = 650 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	60		ns
E_{off}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	4.7		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		0.71		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		0.57		K/W



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Features*

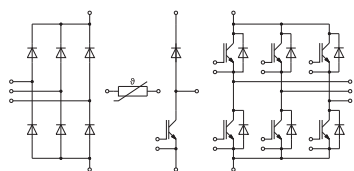
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- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

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

Remarks

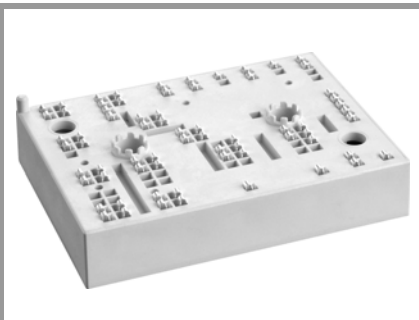
- Max. case temperature limited to $T_C=125^\circ\text{C}$
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
V _{CE(sat)}	I _C = 50 A	T _j = 25 °C		1.85	2.10	V
	V _{GE} = 15 V chiplevel	T _j = 150 °C		2.20	2.40	V
V _{CE0}	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 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	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	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	
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	T _j = 25 °C		2.22	2.54	V
	V _{GE} = 0 V chiplevel	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	T _j = 150 °C		45		A
Q _{rr}	di/dt _{off} = 1400 A/μs	T _j = 150 °C		8.6		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	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	T _j = 25 °C		2.22	2.54	V
	V _{GE} = 0 V chiplevel	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	T _j = 150 °C		45		A
Q _{rr}	di/dt _{off} = 1400 A/μs	T _j = 150 °C		8.6		μC
E _{rr}	V _{GE} = -15 V V _{CC} = 600 V	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

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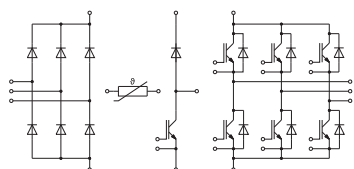
Typical Applications

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

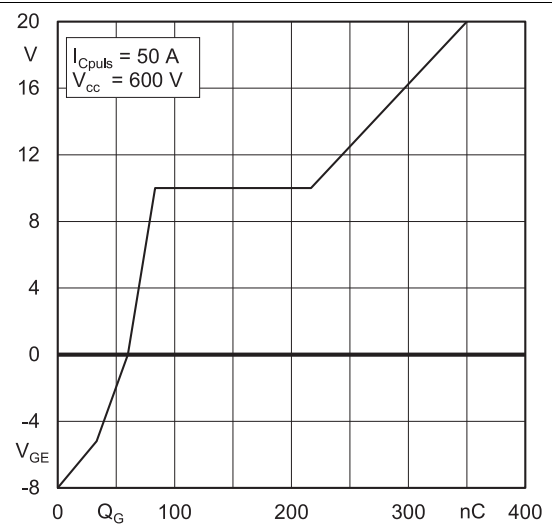
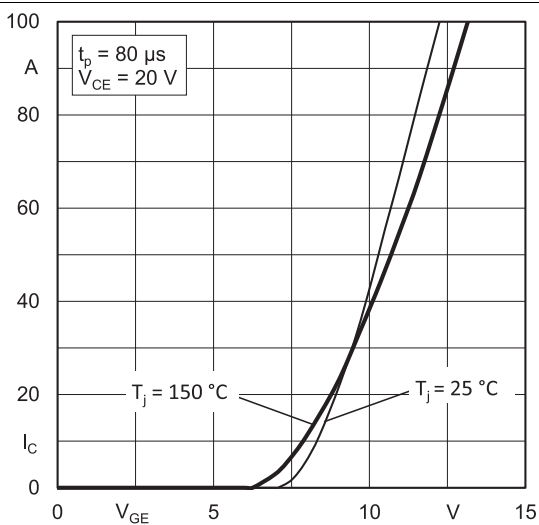
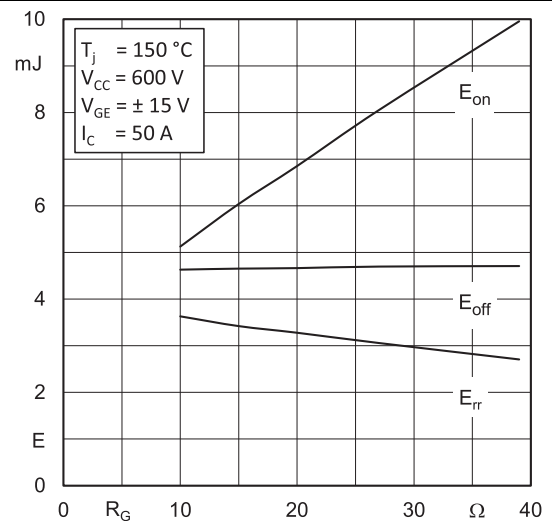
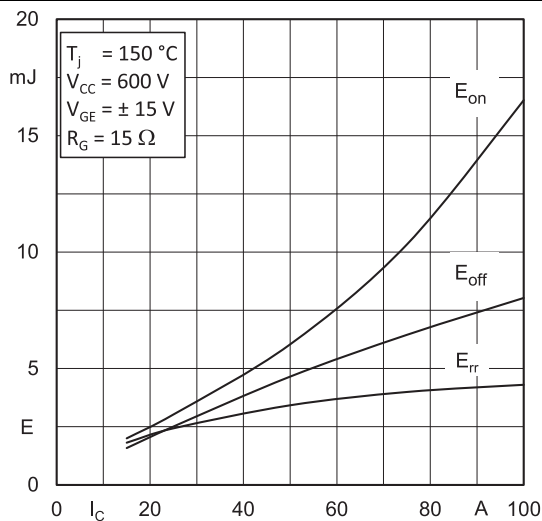
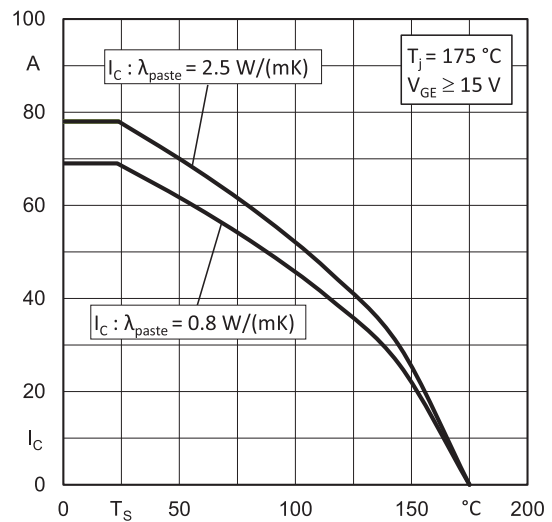
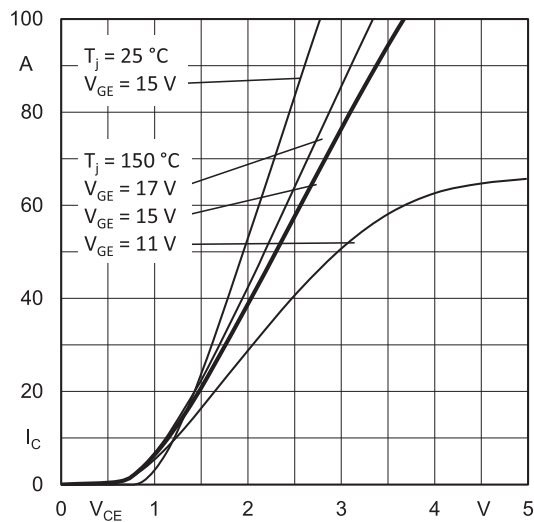
Remarks

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

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
V _F = V _{EC}	I _F = 25 A	T _j = 25 °C		1.00	1.21	V
	chiplevel	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					



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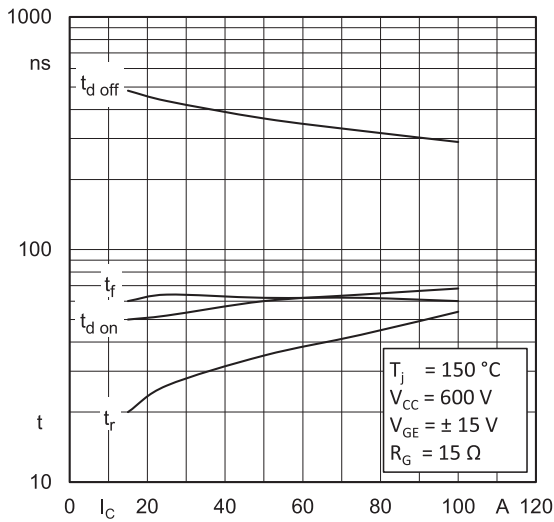


Fig. 7: Typ. switching times vs. I_C

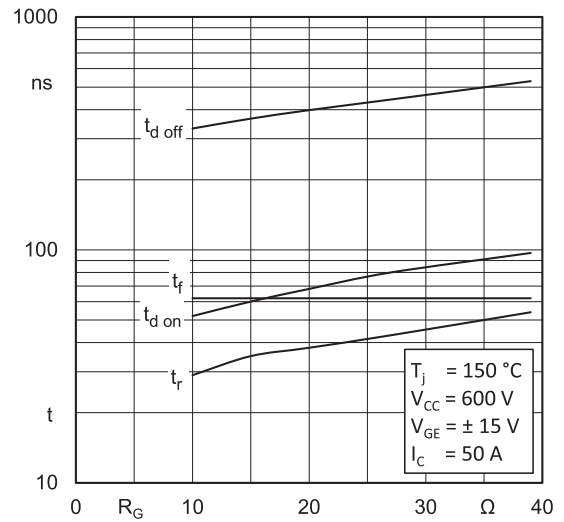


Fig. 8: Typ. switching times vs. gate resistor R_G

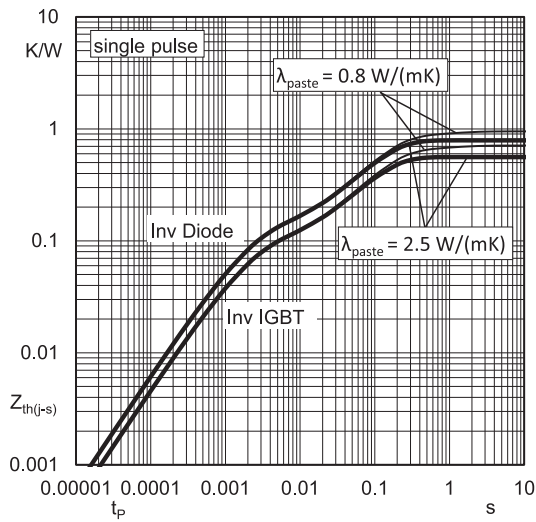


Fig. 9: Typ. transient thermal impedance

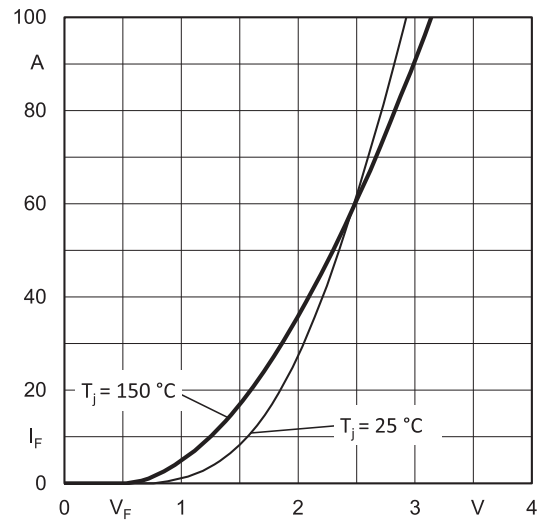


Fig. 10: Typ. CAL diode forward characteristic

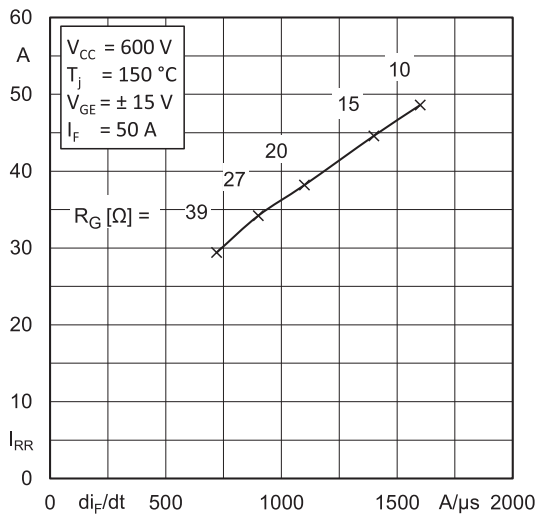


Fig. 11: Typ. CAL diode peak reverse recovery current

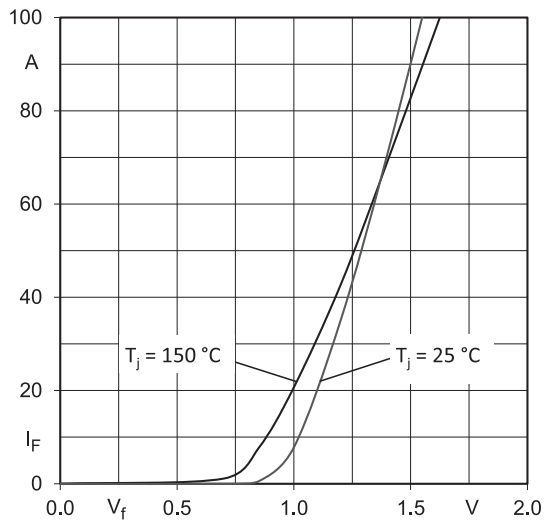
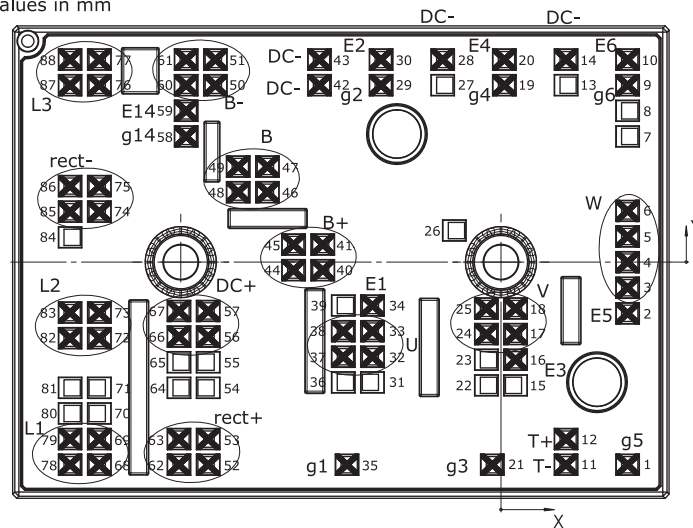


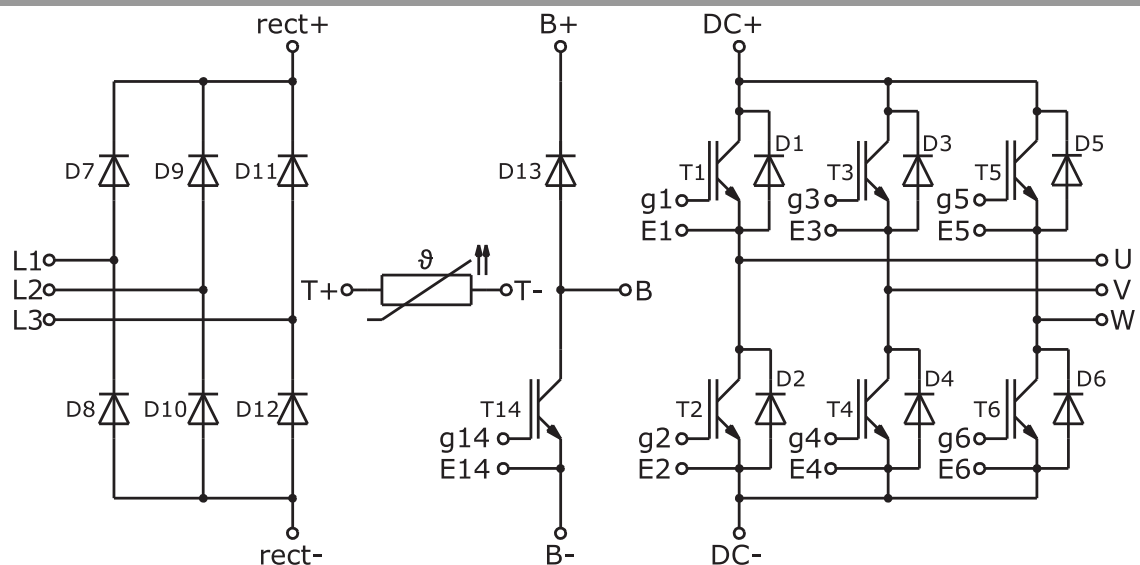
Fig. 12: Typ. input bridge forward characteristic

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**

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