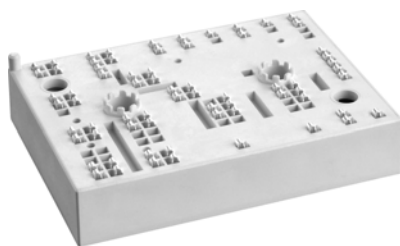


SKiiP 39NAB12T7V1



MiniSKiiP® 3

Converter-Inverter-Brake (CIB)

SKiiP 39NAB12T7V1

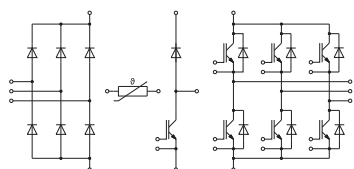
Features*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- New SKR PEP diode technology for enhanced power and environmental robustness
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Remarks

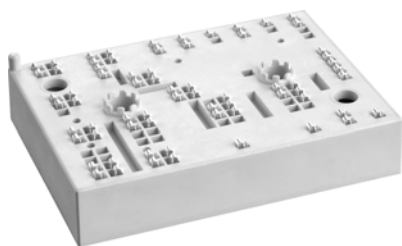
- Max. case temperature limited to $T_C = T_S = 125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$; $T_{j,op} > 150^\circ\text{C}$ during overload (Details see AN19-002)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information.
- For storage and case temperature with TIM see document "Technical Explanations Thermal Interface Materials"
- Inverter IGBT: T1 – T6
- Chopper IGBT: T14
- Inverse Diode: D1 – D6
- Freewheeling Diode: D13
- Rectifier Diode: D7 – D12
- All graphs are referring to inverter/rectifier part

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 = 70 °C	135	A
	T _j = 175 °C	T _s = 100 °C	108	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 70 °C	169	A
	T _j = 175 °C	T _s = 100 °C	137	A
I _{Cnom}			150	A
I _{CRM}			300	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 175 °C	7	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 = 70 °C	120	A
	T _j = 175 °C	T _s = 100 °C	98	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 70 °C	143	A
	T _j = 175 °C	T _s = 100 °C	116	A
I _{Cnom}			100	A
I _{CRM}			200	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 175 °C	7	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 = 70 °C	88	A
	T _j = 175 °C	T _s = 100 °C	69	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 70 °C	106	A
	T _j = 175 °C	T _s = 100 °C	85	A
I _{FRM}			300	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		760	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 = 70 °C	80	A
	T _j = 175 °C	T _s = 100 °C	64	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 70 °C	94	A
	T _j = 175 °C	T _s = 100 °C	75	A
I _{FRM}			200	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 150 °C		550	A
T _j			-40 ... 175	°C



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Converter-Inverter-Brake (CIB)

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Features*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- New SKR PEP diode technology for enhanced power and environmental robustness
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Remarks

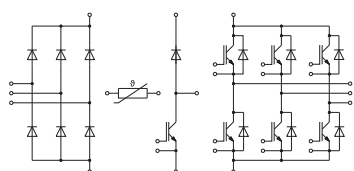
- Max. case temperature limited to $T_C = T_S = 125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$; $T_{j,op} > 150^\circ\text{C}$ during overload (Details see AN19-002)
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Absolute Maximum Ratings

Symbol	Conditions	Values	Unit
Rectifier - Diode			
V_{RRM}	$T_j = 25^\circ\text{C}$	1600	V
I_F	$\lambda_{paste} = 0.8 \text{ W/(mK)}$	$T_s = 70^\circ\text{C}$	A
	$T_j = 175^\circ\text{C}$	$T_s = 100^\circ\text{C}$	A
I_F	$\lambda_{paste} = 2.5 \text{ W/(mK)}$	$T_s = 70^\circ\text{C}$	A
	$T_j = 175^\circ\text{C}$	$T_s = 100^\circ\text{C}$	A
I_{FSM}	$t_p = 10 \text{ ms}$	$T_j = 25^\circ\text{C}$	A
	$\sin 180^\circ$	$T_j = 150^\circ\text{C}$	A
i^2t	$t_p = 10 \text{ ms}$	$T_j = 25^\circ\text{C}$	A^2s
	$\sin 180^\circ$	$T_j = 150^\circ\text{C}$	A^2s
T_j		-40 ... 175	$^\circ\text{C}$
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

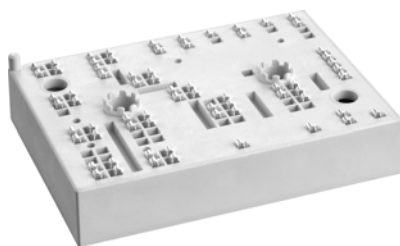
Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 150 \text{ A}$	$T_j = 25^\circ\text{C}$	1.55	1.70	V
	$V_{GE} = 15 \text{ V}$	$T_j = 150^\circ\text{C}$	1.73	1.88	V
	chipelevel	$T_j = 175^\circ\text{C}$	1.77	1.92	V
V_{CE0}		$T_j = 25^\circ\text{C}$	1.00	1.05	V
	chipelevel	$T_j = 150^\circ\text{C}$	0.80	0.85	V
		$T_j = 175^\circ\text{C}$	0.75	0.80	V
r_{CE}	$V_{GE} = 15 \text{ V}$	$T_j = 25^\circ\text{C}$	3.7	4.3	$\text{m}\Omega$
	chipelevel	$T_j = 150^\circ\text{C}$	6.2	6.9	$\text{m}\Omega$
		$T_j = 175^\circ\text{C}$	6.8	7.5	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 3.5 \text{ mA}$	5.15	5.8	6.45	V
I_{CES}	$V_{GE} = 0 \text{ V}$, $V_{CE} = 1200 \text{ V}$, $T_j = 25^\circ\text{C}$			1.5	mA
C_{ies}	$V_{CE} = 25 \text{ V}$	$f = 1 \text{ MHz}$	30.00		nF
C_{oes}	$V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	0.39		nF
C_{res}		$f = 1 \text{ MHz}$	0.10		nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		2100		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		1.0		Ω
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$	$T_j = 25^\circ\text{C}$	170		ns
	$I_C = 150 \text{ A}$	$T_j = 150^\circ\text{C}$	181		ns
	$R_{G on} = 1.1 \Omega$	$T_j = 175^\circ\text{C}$	183		ns
t_r	$R_{G off} = 1.1 \Omega$	$T_j = 25^\circ\text{C}$	34		ns
	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	39		ns
		$T_j = 175^\circ\text{C}$	40		ns
E_{on}	@ $T_j = 150^\circ\text{C}$:	$T_j = 25^\circ\text{C}$	4.6		mJ
	$di/dt_{on} = 3970 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	9.9		mJ
	$dv/dt = 3730 \text{ V}/\mu\text{s}$	$T_j = 175^\circ\text{C}$	12		mJ



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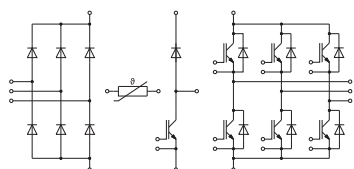
SKiiP 39NAB12T7V1

Features*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- New SKR PEP diode technology for enhanced power and environmental robustness
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Remarks

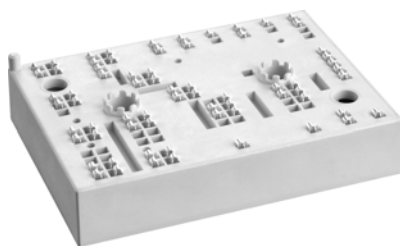
- Max. case temperature limited to $T_C = T_S = 125^\circ\text{C}$
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverter - IGBT						
t _{d(off)}	V _{CC} = 600 V	T _j = 25 °C		274		ns
	I _C = 150 A	T _j = 150 °C		370		ns
	R _{G on} = 1.1 Ω	T _j = 175 °C		389		ns
t _f	R _{G off} = 1.1 Ω	T _j = 25 °C		65		ns
	V _{GE} = +15/-15 V	T _j = 150 °C		100		ns
		T _j = 175 °C		106		ns
E _{off}	@ T _j = 150 °C:	T _j = 25 °C		11		mJ
	di/dt _{on} = 3970 A/μs	T _j = 150 °C		18.7		mJ
	di/dt _{off} = 1530 A/μs	T _j = 175 °C		21		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.43		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			0.3		K/W
Chopper - IGBT						
V _{CE(sat)}	I _C = 100 A	T _j = 25 °C		1.50	1.70	V
	V _{GE} = 15 V	T _j = 150 °C		1.68	1.88	V
	chipelevel	T _j = 175 °C		1.77	1.92	V
V _{CE0}		T _j = 25 °C		1.00	1.05	V
	chipelevel	T _j = 150 °C		0.80	0.85	V
		T _j = 175 °C		0.75	0.80	V
r _{CE}		T _j = 25 °C		5.0	6.5	mΩ
	V _{GE} = 15 V	T _j = 150 °C		8.8	10	mΩ
	chipelevel	T _j = 175 °C		10	11	mΩ
V _{GE(th)}	V _{GE} = V _{CE} , I _C = 2.5 mA		5.15	5.8	6.45	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		21.70		nF
C _{oes}		f = 1 MHz		0.28		nF
C _{res}		f = 1 MHz		0.08		nF
Q _G	V _{GE} = -8V ... + 15 V			1400		nC
R _{Gint}	T _j = 25 °C			1.5		Ω
t _{d(on)}	V _{CC} = 600 V I _C = 100 A R _{G on} = 1.7 Ω R _{G off} = 1.7 Ω V _{GE} = +15/-15 V	T _j = 25 °C		162		ns
		T _j = 150 °C		171		ns
		T _j = 175 °C		173		ns
t _r		T _j = 25 °C		31		ns
		T _j = 150 °C		38		ns
		T _j = 175 °C		38		ns
E _{on}		T _j = 25 °C		5		mJ
		T _j = 150 °C		9.3		mJ
		T _j = 175 °C		11		mJ
t _{d(off)}		T _j = 25 °C		256		ns
	@ T _j = 150 °C:	T _j = 150 °C		350		ns
	di/dt _{on} = 2620 A/μs	T _j = 175 °C		368		ns
t _f	di/dt _{off} = 1030 A/μs	T _j = 25 °C		57		ns
	dv/dt = 3680 V/μs	T _j = 150 °C		89		ns
		T _j = 175 °C		100		ns
E _{off}		T _j = 25 °C		6.6		mJ
		T _j = 150 °C		12		mJ
		T _j = 175 °C		13		mJ
R _{th(j-s)}	per IGBT, λ _{paste} =0.8 W/(mK)			0.41		K/W
R _{th(j-s)}	per IGBT, λ _{paste} =2.5 W/(mK)			0.31		K/W

SKiiP 39NAB12T7V1



MiniSKiiP® 3

Converter-Inverter-Brake (CIB)

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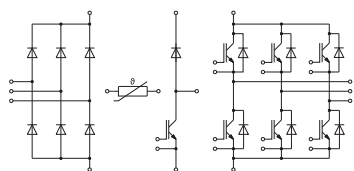
Features*

- 1200V Generation 7 IGBTs (T7)
- Robust and soft switching freewheeling diodes in CAL technology
- New SKR PEP diode technology for enhanced power and environmental robustness
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Remarks

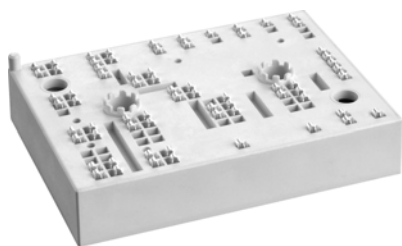
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- All graphs are referring to inverter/rectifier part

Characteristics					
Symbol	Conditions		min.	typ.	max. Unit
Inverse - Diode					
$V_F = V_{EC}$	$I_F = 150\text{ A}$	$T_j = 25^\circ\text{C}$		2.28	2.63 V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		2.28	2.61 V
	chipelevel	$T_j = 175^\circ\text{C}$		2.12	2.46 V
V_{F0}		$T_j = 25^\circ\text{C}$		1.30	1.50 V
	chipelevel	$T_j = 150^\circ\text{C}$		0.90	1.10 V
		$T_j = 175^\circ\text{C}$		0.82	0.98 V
r_F		$T_j = 25^\circ\text{C}$		6.6	7.5 mΩ
	chipelevel	$T_j = 150^\circ\text{C}$		9.2	10 mΩ
		$T_j = 175^\circ\text{C}$		8.6	9.8 mΩ
I_{RRM}		$T_j = 25^\circ\text{C}$		193	A
		$T_j = 150^\circ\text{C}$		241	A
	$V_{CC} = 600\text{ V}$	$T_j = 175^\circ\text{C}$		255	A
Q_{rr}	$I_F = 150\text{ A}$	$T_j = 25^\circ\text{C}$		9	μC
	$V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		23	μC
	@ $T_j = 150^\circ\text{C}$:	$T_j = 175^\circ\text{C}$		28	μC
E_{rr}	$di/dt_{off} = 3910\text{ A/μs}$	$T_j = 25^\circ\text{C}$		4.8	mJ
		$T_j = 150^\circ\text{C}$		12	mJ
		$T_j = 175^\circ\text{C}$		14	mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 0.8\text{ W/(mK)}$			0.65	K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 2.5\text{ W/(mK)}$			0.49	K/W
Freewheeling - Diode					
$V_F = V_{EC}$	$I_F = 100\text{ A}$	$T_j = 25^\circ\text{C}$		2.20	2.52 V
	$V_{GE} = 0\text{ V}$	$T_j = 150^\circ\text{C}$		2.15	2.47 V
	chipelevel	$T_j = 175^\circ\text{C}$		2.00	2.31 V
V_{F0}		$T_j = 25^\circ\text{C}$		1.30	1.50 V
	chipelevel	$T_j = 150^\circ\text{C}$		0.90	1.10 V
		$T_j = 175^\circ\text{C}$		0.82	0.98 V
r_F		$T_j = 25^\circ\text{C}$		9.0	10 mΩ
	chipelevel	$T_j = 150^\circ\text{C}$		13	14 mΩ
		$T_j = 175^\circ\text{C}$		12	13 mΩ
I_{RRM}		$T_j = 25^\circ\text{C}$		93	A
		$T_j = 150^\circ\text{C}$		116	A
	$V_{CC} = 600\text{ V}$	$T_j = 175^\circ\text{C}$		120	A
Q_{rr}	$I_F = 100\text{ A}$	$T_j = 25^\circ\text{C}$		5.9	μC
	$V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		15	μC
	@ $T_j = 150^\circ\text{C}$:	$T_j = 175^\circ\text{C}$		19	μC
E_{rr}	$di/dt_{off} = 2590\text{ A/μs}$	$T_j = 25^\circ\text{C}$		2.2	mJ
		$T_j = 150^\circ\text{C}$		5.9	mJ
		$T_j = 175^\circ\text{C}$		7.3	mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 0.8\text{ W/(mK)}$			0.65	K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste} = 2.5\text{ W/(mK)}$			0.51	K/W



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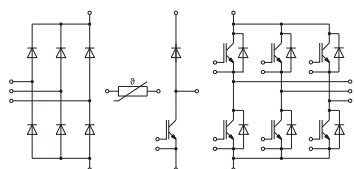
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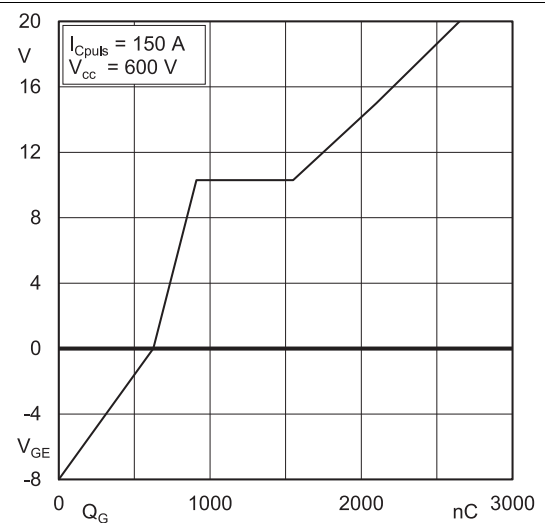
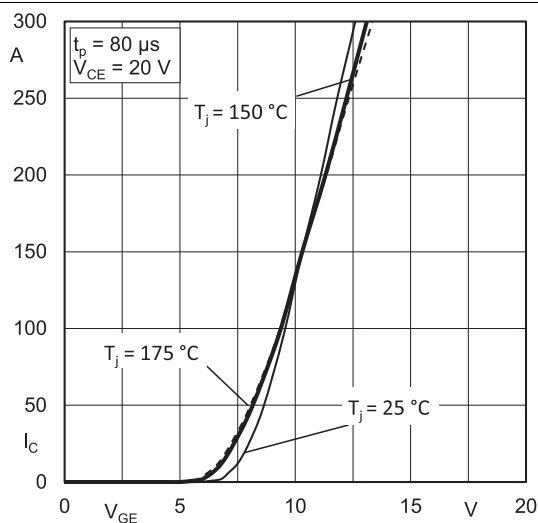
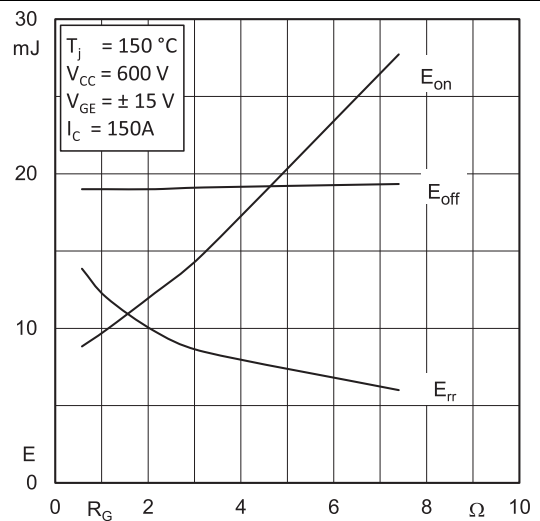
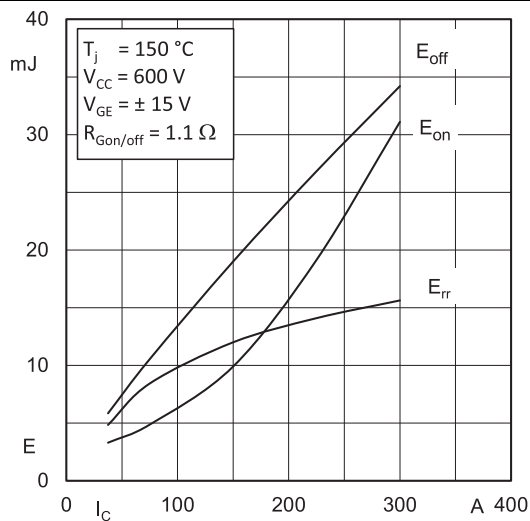
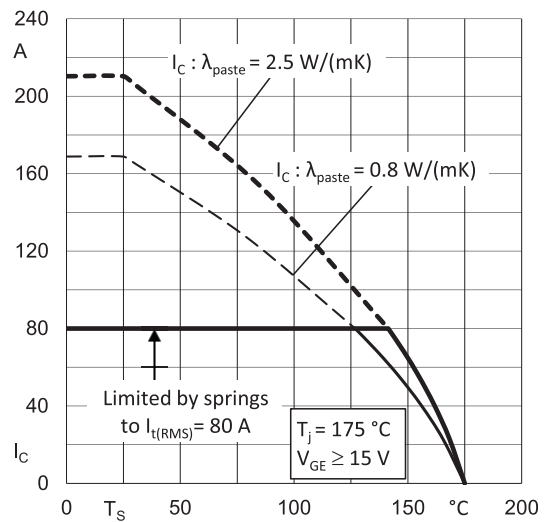
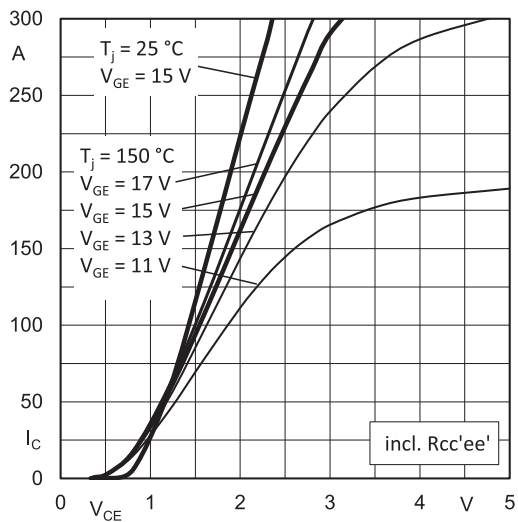
Remarks

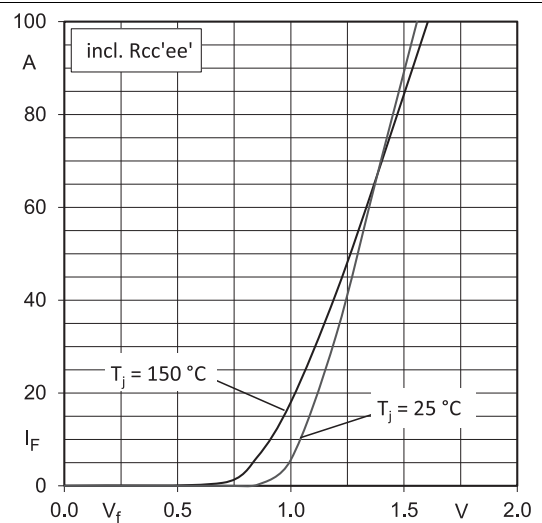
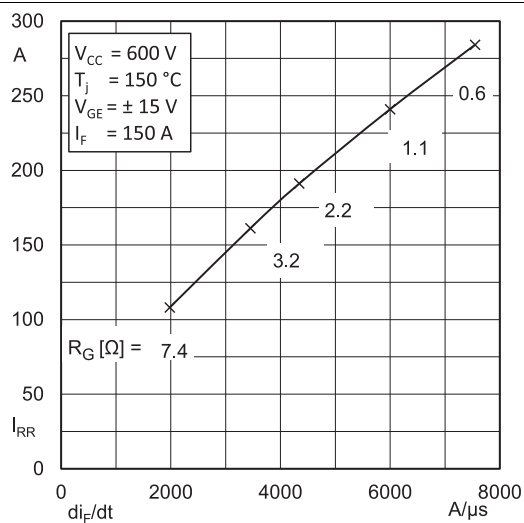
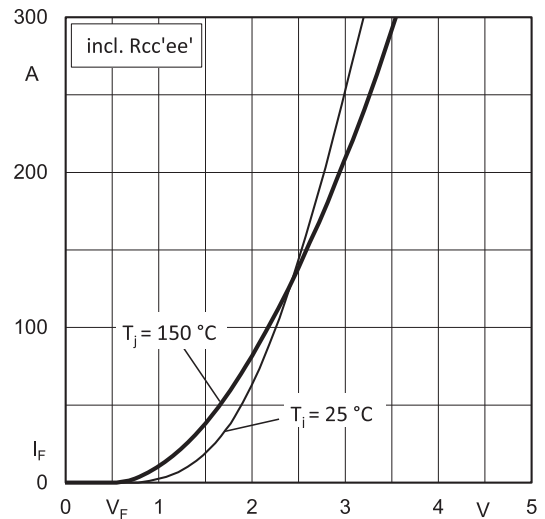
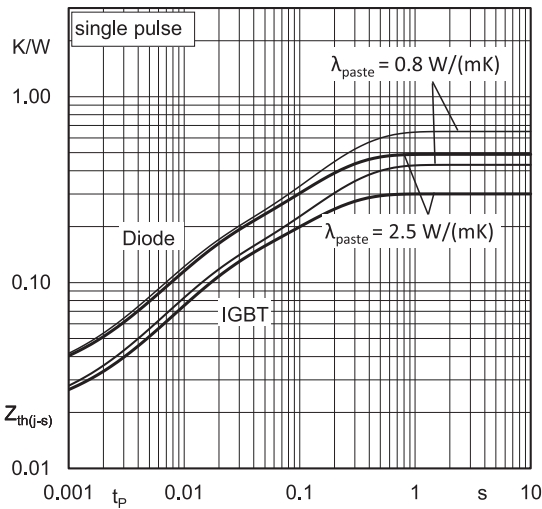
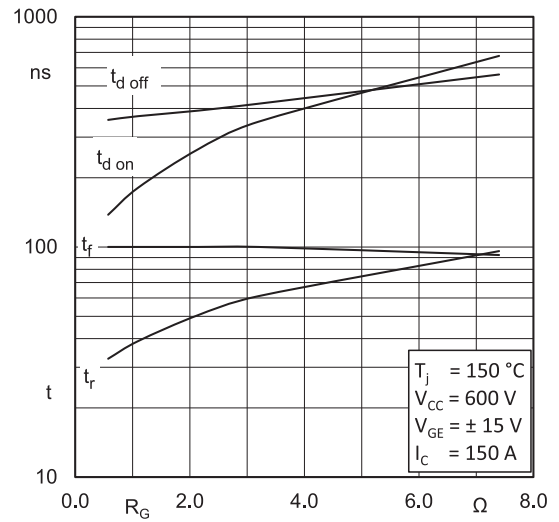
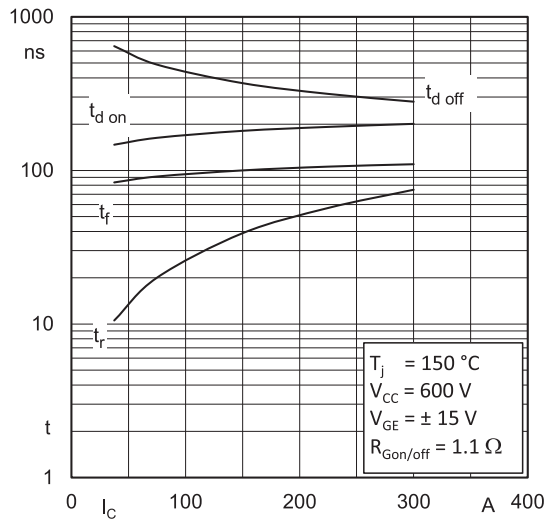
- Max. case temperature limited to $T_C = T_S = 125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$; $T_{j,op} > 150^\circ\text{C}$ during overload (Details see AN19-002)
- MiniSKiiP "Technical Explanations" and "Mounting Instructions" are part of the data sheet. Please refer to both documents for further information.
- For storage and case temperature with TIM see document "Technical Explanations Thermal Interface Materials"
- Inverter IGBT: T1 – T6
- Chopper IGBT: T14
- Inverse Diode: D1 – D6
- Freewheeling Diode: D13
- Rectifier Diode: D7 – D12
- All graphs are referring to inverter/rectifier part

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
V _F	I _F = 44 A chiplevel	T _j = 25 °C		0.97	1.20	V
		T _j = 150 °C		0.84	1.07	V
		T _j = 175 °C		0.82	1.05	V
V _{F0}	chiplevel	T _j = 25 °C		0.89	1.09	V
		T _j = 150 °C		0.73	0.92	V
		T _j = 175 °C		0.69	0.88	V
r _F	chiplevel	T _j = 25 °C		1.84	2.5	mΩ
		T _j = 150 °C		2.6	3.5	mΩ
		T _j = 175 °C		2.9	3.9	mΩ
I _R	T _j = 150 °C, V _{RRM}				1.7	mA
R _{th(j-s)}	per Diode, λ _{paste} =0.8 W/(mK)			0.51		K/W
R _{th(j-s)}	per Diode, λ _{paste} =2.5 W/(mK)			0.44		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					



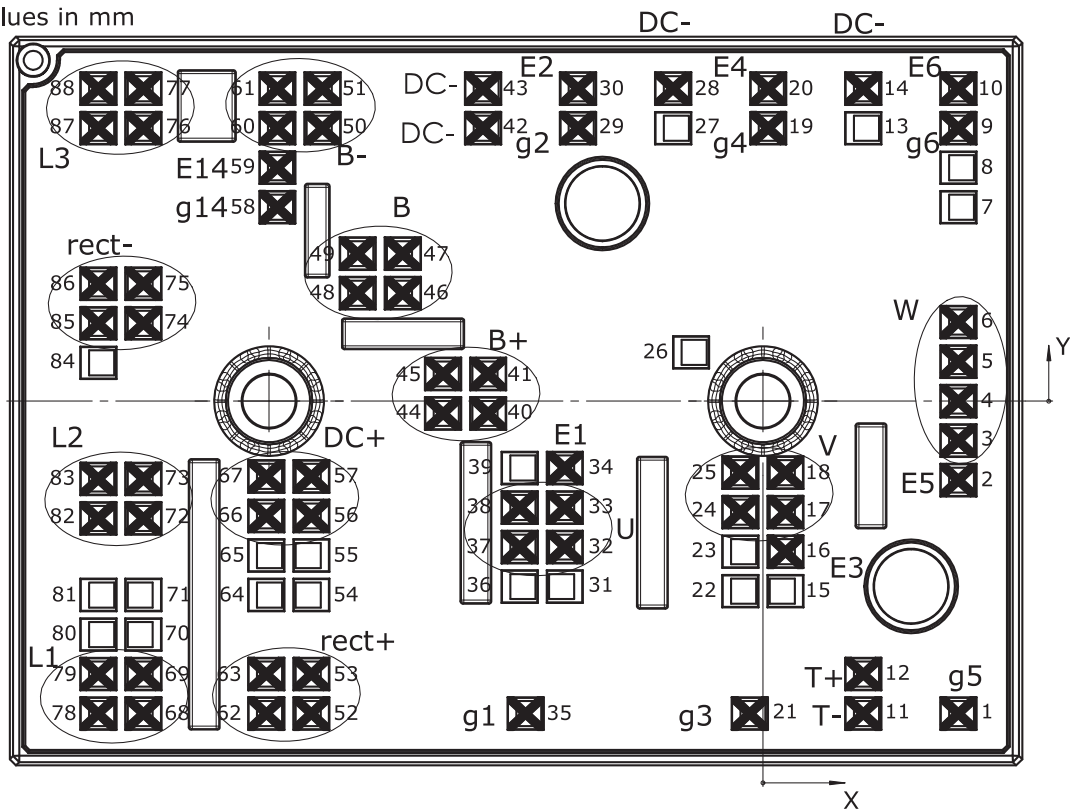
NAB



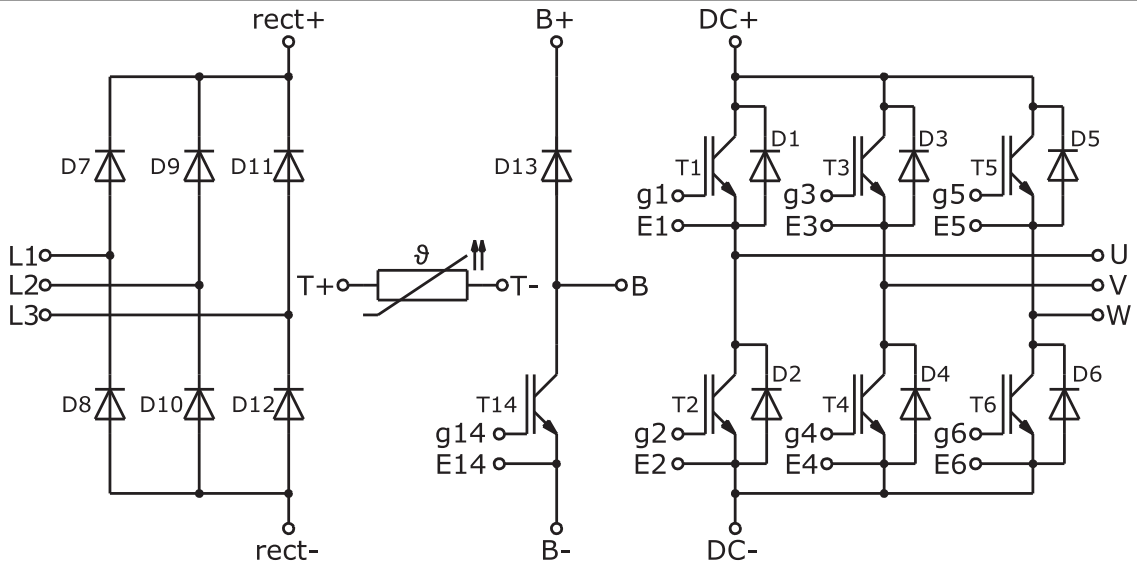


Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	15,83	-25,30	g5	31	-16,05	-15,02		61	-39,33	25,30	B-
2	15,83	-6,40	E5	32	-16,05	-11,82	U	62	-40,23	-25,30	rect+
3	15,83	-3,20	W	33	-16,05	-8,62	U	63	-40,23	-22,10	rect+
4	15,83	0	W	34	-16,05	-5,42	E1	64	-40,23	-15,70	
5	15,83	3,20	W	35	-19,70	-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



Pinout

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

*IMPORTANT INFORMATION AND WARNINGS

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