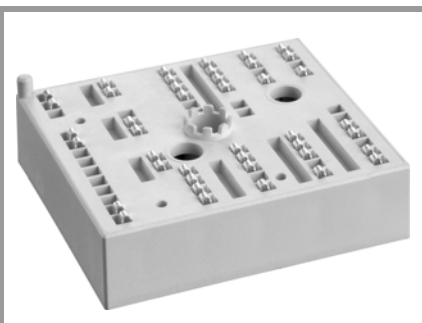


SKiiP 22NAB12T4V2



MiniSKiiP® 2

Converter-Inverter-Brake (CIB)

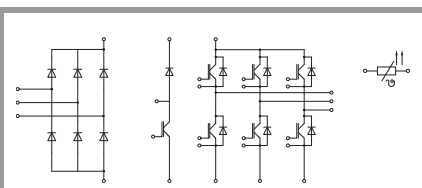
SKiiP 22NAB12T4V2

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

Remarks

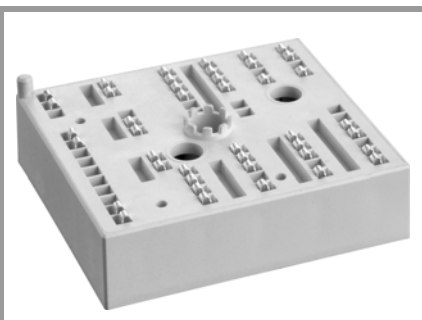
- Max. case temperature limited to $T_C=125^{\circ}\text{C}$
- Product reliability results valid for $T_j \leq 150^{\circ}\text{C}$ (recommended $T_{j,op} = -40 \dots +150^{\circ}\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information
- No functional isolation between temperature sensor and "-DC/V" and "-DC/W"



NAB

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverter - IGBT				
V_{CES}	$T_j = 25^{\circ}\text{C}$		1200	V
I_C	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^{\circ}\text{C}$	27	A
		$T_j = 175^{\circ}\text{C}$	22	A
I_C	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^{\circ}\text{C}$	30	A
		$T_j = 175^{\circ}\text{C}$	24	A
I_{Chom}			15	A
I_{CRM}			45	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800 \text{ V}$ $V_{GE} \leq 15 \text{ V}$ $V_{CES} \leq 1200 \text{ V}$	$T_j = 150^{\circ}\text{C}$	10	μs
T_j			-40 ... 175	$^{\circ}\text{C}$
Chopper - IGBT				
V_{CES}	$T_j = 25^{\circ}\text{C}$		1200	V
I_C	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^{\circ}\text{C}$	27	A
		$T_j = 175^{\circ}\text{C}$	22	A
I_C	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^{\circ}\text{C}$	30	A
		$T_j = 175^{\circ}\text{C}$	24	A
I_{Chom}			15	A
I_{CRM}			45	A
V_{GES}			-20 ... 20	V
t_{psc}	$V_{CC} = 800 \text{ V}$ $V_{GE} \leq 15 \text{ V}$ $V_{CES} \leq 1200 \text{ V}$	$T_j = 150^{\circ}\text{C}$	10	μs
T_j			-40 ... 175	$^{\circ}\text{C}$
Inverse - Diode				
V_{RRM}	$T_j = 25^{\circ}\text{C}$		1200	V
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^{\circ}\text{C}$	22	A
		$T_j = 175^{\circ}\text{C}$	18	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^{\circ}\text{C}$	24	A
		$T_j = 175^{\circ}\text{C}$	20	A
I_{FRM}			30	A
I_{FSM}	$t_p = 10 \text{ ms, sin } 180^{\circ}, T_j = 150^{\circ}\text{C}$		65	A
T_j			-40 ... 175	$^{\circ}\text{C}$
Freewheeling - Diode				
V_{RRM}	$T_j = 25^{\circ}\text{C}$		1200	V
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^{\circ}\text{C}$	22	A
		$T_j = 175^{\circ}\text{C}$	18	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^{\circ}\text{C}$	24	A
		$T_j = 175^{\circ}\text{C}$	20	A
I_{FRM}			30	A
I_{FSM}	$t_p = 10 \text{ ms, sin } 180^{\circ}, T_j = 150^{\circ}\text{C}$		65	A
T_j			-40 ... 175	$^{\circ}\text{C}$

SKiiP 22NAB12T4V2



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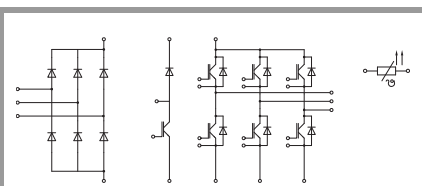
SKiiP 22NAB12T4V2

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

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 $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information
- No functional isolation between temperature sensor and "-DC/V" and "-DC/W"

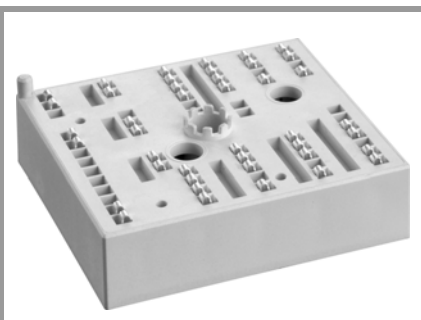


NAB

Absolute Maximum Ratings				
Symbol	Conditions	Values	Unit	
Rectifier - Diode				
V_{RRM}	$T_j = 25^\circ\text{C}$	1600	V	
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	37	A
	$T_j = 150^\circ\text{C}$	$T_s = 70^\circ\text{C}$	28	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	40	A
	$T_j = 150^\circ\text{C}$	$T_s = 70^\circ\text{C}$	31	A
I_{FSM}	$t_p = 10 \text{ ms}$	$T_j = 25^\circ\text{C}$	220	A
	$\sin 180^\circ$	$T_j = 150^\circ\text{C}$	200	A
i^2t	$t_p = 10 \text{ ms}$	$T_j = 25^\circ\text{C}$	242	A^2s
	$\sin 180^\circ$	$T_j = 150^\circ\text{C}$	200	A^2s
T_j		-40 ... 150	$^\circ\text{C}$	
Module				
$I_{t(RMS)}$	$T_{terminal} = 80^\circ\text{C}$, 20 A per spring	18	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					
$V_{CE(sat)}$	$I_C = 15 \text{ A}$ $V_{GE} = 15 \text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	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	$T_j = 25^\circ\text{C}$	70	80	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	103	110	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 0.5 \text{ mA}$	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}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	0.90		nF
C_{oes}		$f = 1 \text{ MHz}$	0.08		nF
C_{res}		$f = 1 \text{ MHz}$	0.06		nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		85		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0		Ω
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$ $I_C = 15 \text{ A}$	$T_j = 150^\circ\text{C}$	5		ns
t_r	$R_{G on} = 16 \Omega$	$T_j = 150^\circ\text{C}$	37		ns
E_{on}	$R_{G off} = 16 \Omega$	$T_j = 150^\circ\text{C}$	1.5		mJ
$t_{d(off)}$	$di/dt_{on} = 370 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	286		ns
t_f	$di/dt_{off} = 167 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	86		ns
E_{off}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	1.54		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		1.4		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		1.2		K/W

SKiiP 22NAB12T4V2



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Converter-Inverter-Brake (CIB)

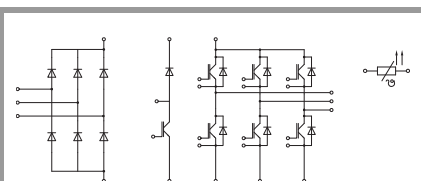
SKiiP 22NAB12T4V2

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

Remarks

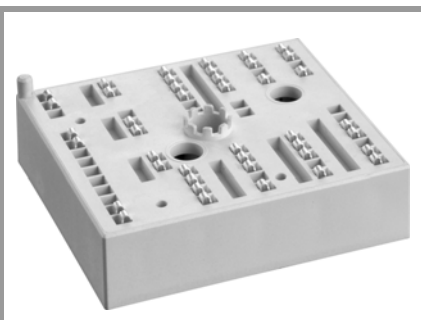
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information
- No functional isolation between temperature sensor and "-DC/V" and "-DC/W"



NAB

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
$V_{CE(sat)}$	$I_C = 15\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	1.85	2.10		V
		$T_j = 150^\circ\text{C}$	2.25	2.45		V
V_{CE0}	chipllevel	$T_j = 25^\circ\text{C}$	0.80	0.90		V
		$T_j = 150^\circ\text{C}$	0.70	0.80		V
r_{CE}	$V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	70	80		m Ω
		$T_j = 150^\circ\text{C}$	103	110		m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 0.5\text{ mA}$		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}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		0.90		nF
C_{oes}		$f = 1\text{ MHz}$		0.08		nF
C_{res}		$f = 1\text{ MHz}$		0.06		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$			85		nC
R_{Gint}	$T_j = 25^\circ\text{C}$			0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		5		ns
t_r	$I_C = 15\text{ A}$	$T_j = 150^\circ\text{C}$		37		ns
E_{on}	$R_{G\ on} = 16\ \Omega$	$T_j = 150^\circ\text{C}$		1.5		mJ
$t_{d(off)}$	$di/dt_{on} = 370\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		286		ns
t_f	$di/dt_{off} = 167\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		86		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$			1.5		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			1.4		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			1.2		K/W
Inverse - Diode						
$V_F = V_{EC}$	$I_F = 15\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	2.38	2.71		V
		$T_j = 150^\circ\text{C}$	2.44	2.77		V
V_{F0}	chipllevel	$T_j = 25^\circ\text{C}$	1.30	1.50		V
		$T_j = 150^\circ\text{C}$	0.90	1.10		V
r_F	chipllevel	$T_j = 25^\circ\text{C}$	72	81		m Ω
		$T_j = 150^\circ\text{C}$	103	111		m Ω
I_{RRM}	$I_F = 15\text{ A}$	$T_j = 150^\circ\text{C}$		11.6		A
Q_{rr}	$di/dt_{off} = 370\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		2.4		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		0.95		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			2		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			1.7		K/W
Freewheeling - Diode						
$V_F = V_{EC}$	$I_F = 15\text{ A}$ $V_{GE} = 0\text{ V}$ chipllevel	$T_j = 25^\circ\text{C}$	2.38	2.71		V
		$T_j = 150^\circ\text{C}$	2.44	2.77		V
V_{F0}	chipllevel	$T_j = 25^\circ\text{C}$	1.30	1.50		V
		$T_j = 150^\circ\text{C}$	0.90	1.10		V
r_F	chipllevel	$T_j = 25^\circ\text{C}$	72	81		m Ω
		$T_j = 150^\circ\text{C}$	103	111		m Ω
I_{RRM}	$I_F = 15\text{ A}$	$T_j = 150^\circ\text{C}$		11.6		A
Q_{rr}	$di/dt_{off} = 370\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		2.4		μC
E_{rr}	$V_{GE} = -15\text{ V}$ $V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		0.95		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			2		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			1.7		K/W

SKiiP 22NAB12T4V2



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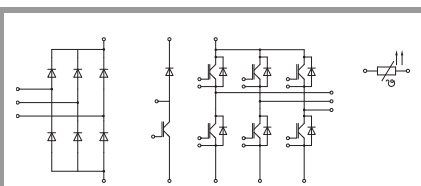
SKiiP 22NAB12T4V2

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

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 $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information
- No functional isolation between temperature sensor and "-DC/V" and "-DC/W"



NAB

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
$V_F = V_{EC}$	$I_F = 8 \text{ A}$ chiplevel	$T_j = 25^\circ\text{C}$		1.00	1.21	V
		$T_j = 125^\circ\text{C}$		0.90	1.10	V
V_{F0}	chiplevel	$T_j = 25^\circ\text{C}$		0.88	0.98	V
		$T_j = 125^\circ\text{C}$		0.73	0.83	V
r_F	chiplevel	$T_j = 25^\circ\text{C}$		15	29	m Ω
		$T_j = 125^\circ\text{C}$		21	34	m Ω
I_R	$T_j = 145^\circ\text{C}, V_{RRM}$				1.1	mA
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8 \text{ W/(mK)}$			1.63		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5 \text{ W/(mK)}$			1.4		K/W
Module						
M_s	to heat sink		2		2.5	Nm
W				55		g
L_{CE}				-		nH
Temperature Sensor						
R_{100}	$T_r=100^\circ\text{C}$ ($R_{25}=1000\Omega$)			1670 \pm 3%		Ω
$R_{(T)}$	$R_{(T)}=1000\Omega[1+A(T-25^\circ\text{C})+B(T-25^\circ\text{C})^2]$, $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$, $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					

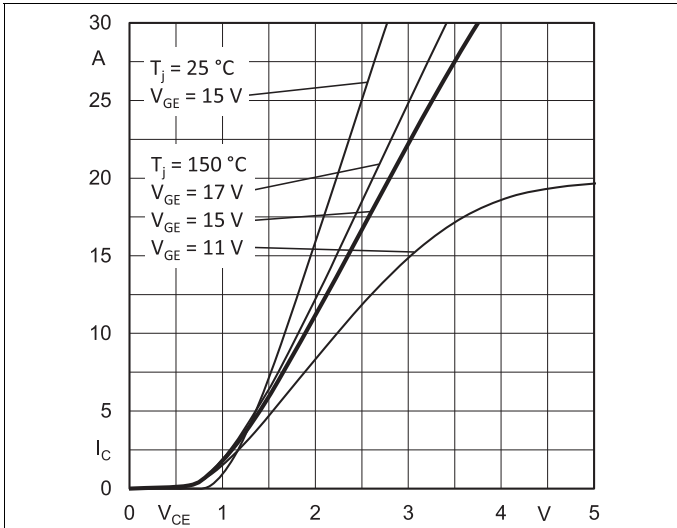


Fig. 1: Typ. output characteristic, inclusive $R_{CC'+EE'}$

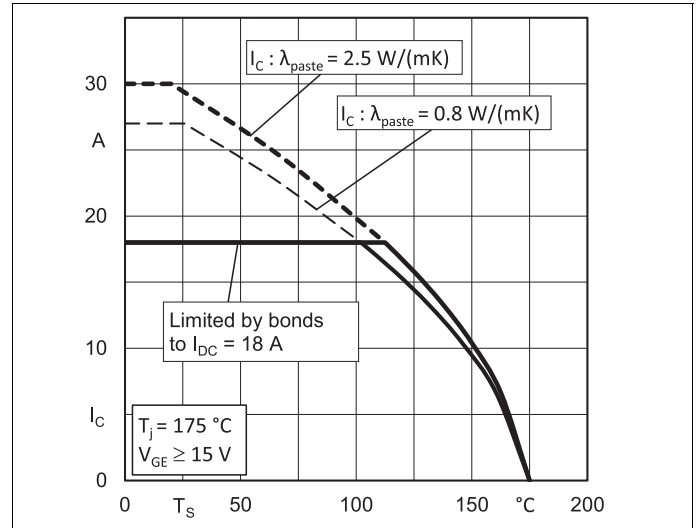


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

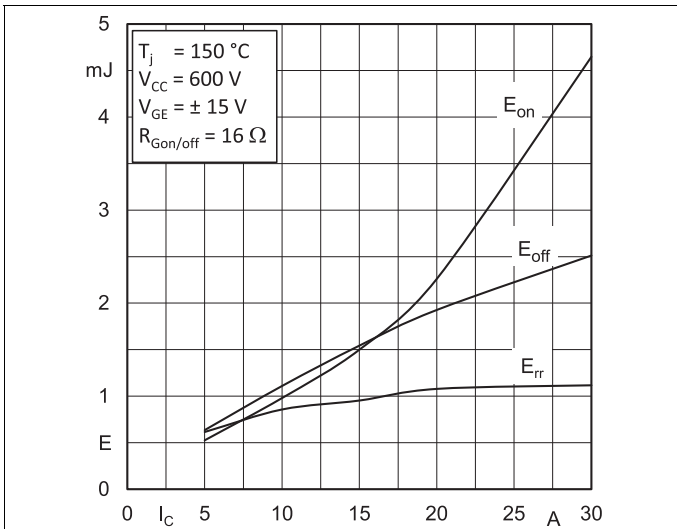


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

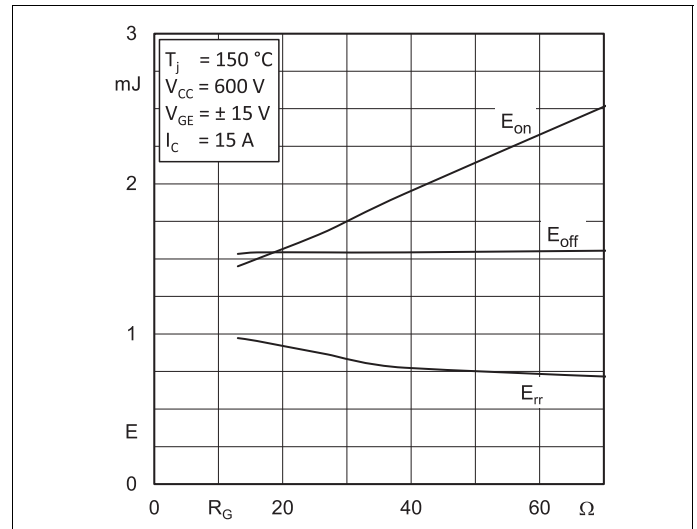


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

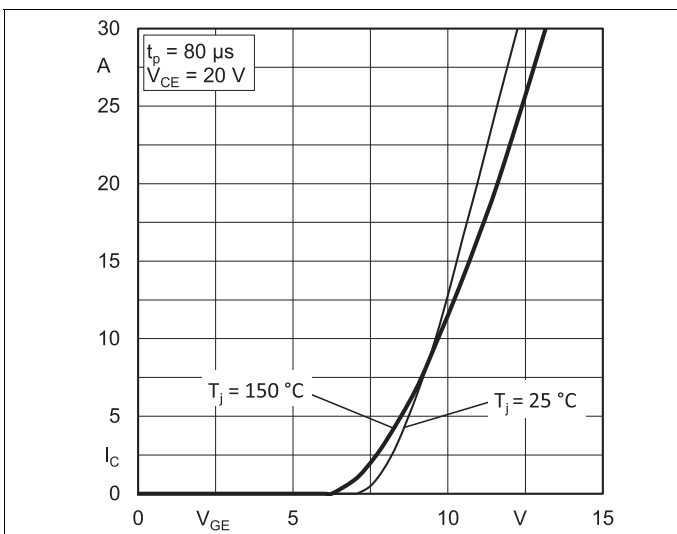


Fig. 5: Typ. transfer characteristic

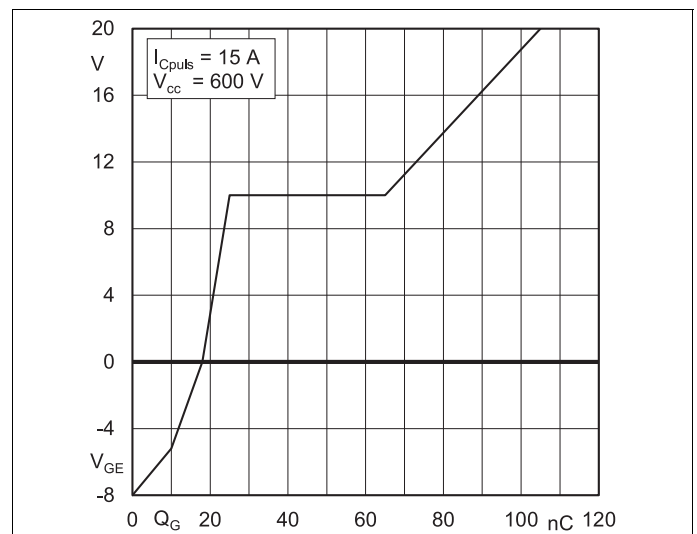


Fig. 6: Typ. gate charge characteristic

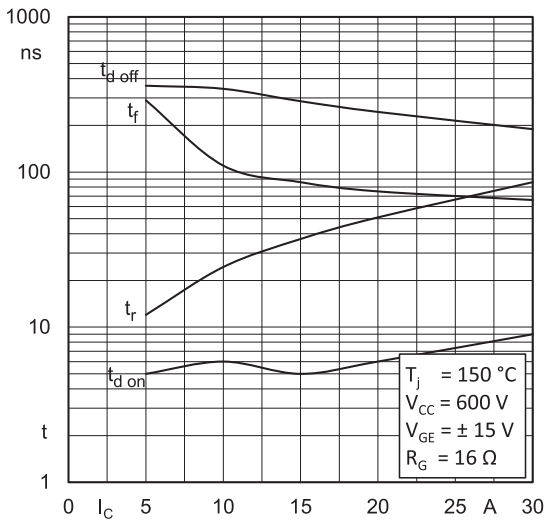


Fig. 7: Typ. switching times vs. I_C

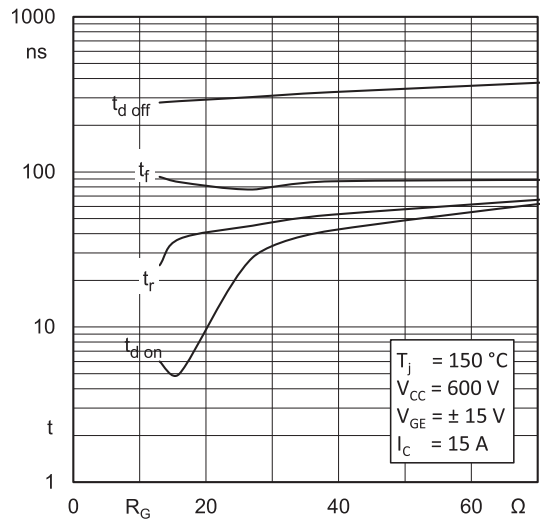


Fig. 8: Typ. switching times vs. gate resistor R_G

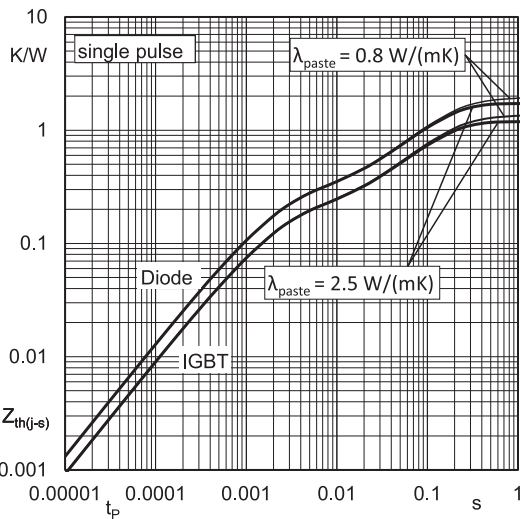


Fig. 9: Typ. transient thermal impedance

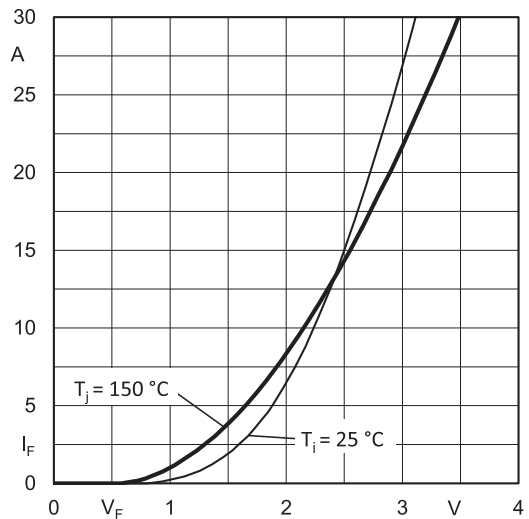


Fig. 10: Typ. CAL diode forward charact., incl. $R_{CC+EE'}$

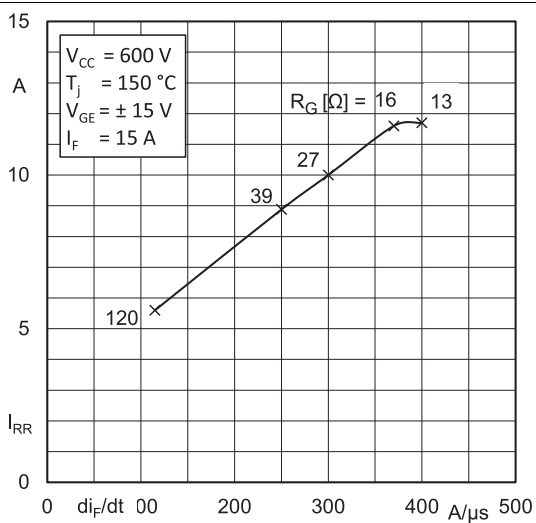


Fig. 11: Typ. CAL diode peak reverse recovery current

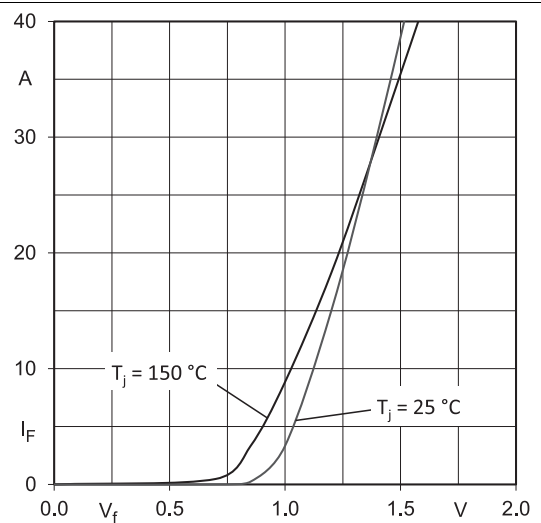
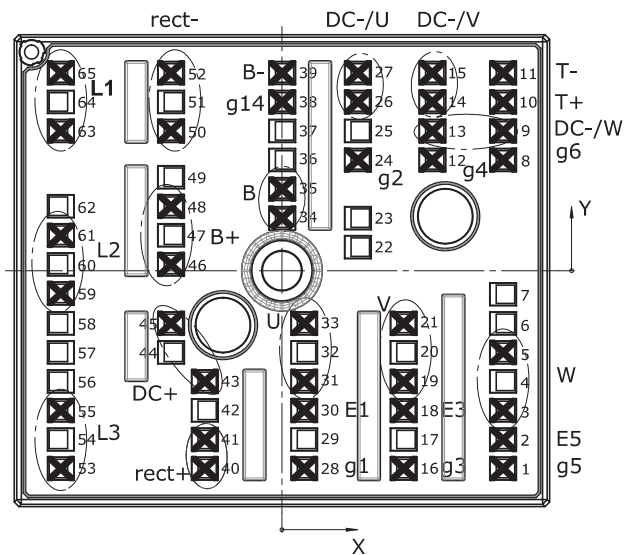


Fig. 12: Typ. input bridge forward characteristic incl. $R_{CC+EE'}$

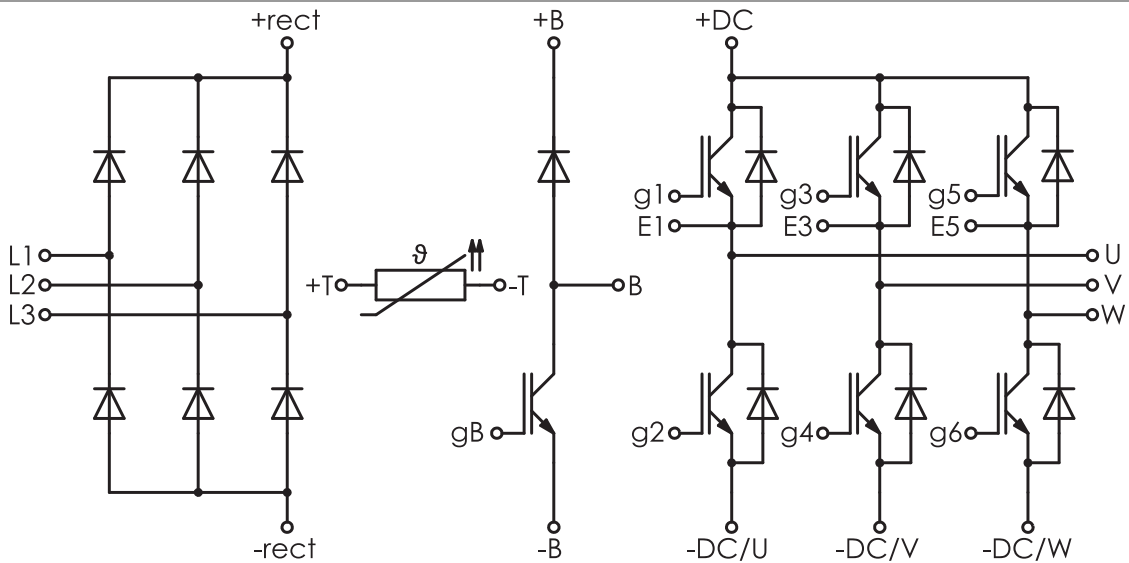
SKiP 22NAB12T4V2

Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	24,38	-21,80	g5	23	8,38	5,80		45	-12,23	-5,80	DC+
2	24,38	-18,60	E5	24	8,38	12,20	g2	46	-12,23	0,70	B+
3	24,38	-15,40	W	25	8,38	15,40		47	-12,23	3,90	
4	24,38	-12,20		26	8,38	18,60	DC-/U	48	-12,23	7,10	B+
5	24,38	-9,00	W	27	8,38	21,80	DC-/U	49	-12,23	10,30	
6	24,38	-5,80		28	2,46	-21,80	g1	50	-12,23	15,40	rect-
7	24,38	-2,60		29	2,46	-18,60		51	-12,23	18,60	
8	24,38	12,20	g6	30	2,46	-15,40	E1	52	-12,23	21,80	rect-
9	24,38	15,40	DC-/W	31	2,46	-12,20	U	53	-24,38	-21,80	L3
10	24,38	18,60	T+	32	2,46	-9,00		54	-24,38	-18,60	
11	24,38	21,80	T-	33	2,46	-5,80	U	55	-24,38	-15,40	L3
12	16,58	12,20	g4	34	0,03	5,80	B	56	-24,38	-12,20	
13	16,58	15,40	DC-/W	35	0,03	9,00	B	57	-24,38	-9,00	
14	16,58	18,60	DC-/V	36	0,03	12,20		58	-24,38	-5,80	
15	16,58	21,80	DC-/V	37	0,03	15,40		59	-24,38	-2,50	L2
16	13,42	-21,80	g3	38	0,03	18,60	g14	60	-24,38	0,70	
17	13,42	-18,60		39	0,03	21,80	B-	61	-24,38	3,90	L2
18	13,42	-15,40	E3	40	-8,51	-21,80	rect+	62	-24,38	7,10	
19	13,42	-12,20	V	41	-8,51	-18,60	rect+	63	-24,38	15,40	L1
20	13,42	-9,00		42	-8,51	-15,40		64	-24,38	18,60	
21	13,42	-5,80	V	43	-8,51	-12,20	DC+	65	-24,38	21,80	L1
22	8,38	2,60		44	-12,23	-9,00					

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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