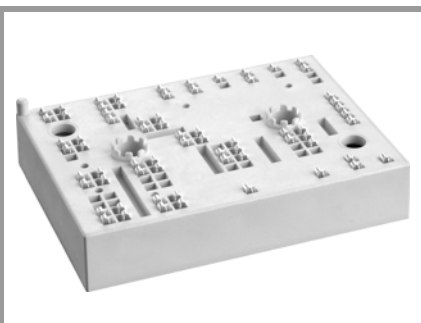


SKiiP 37NAB12T4V1



MiniSKiiP® 3

Converter-Inverter-Brake (CIB)

SKiiP 37NAB12T4V1

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

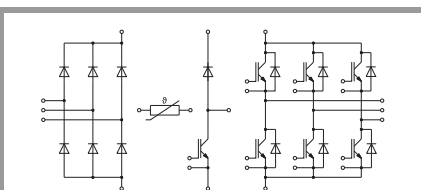
Typical Applications

- Inverter up to 36 kVA
- Typical motor power 22 kW

Remarks

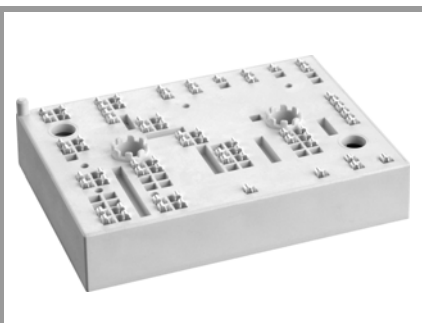
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Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
Inverter - IGBT				
V_{CES}	$T_j = 25^\circ\text{C}$		1200	V
I_C	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	90	A
		$T_j = 175^\circ\text{C}$	73	A
I_C	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	106	A
		$T_j = 175^\circ\text{C}$	86	A
I_{Chom}			75	A
I_{CRM}			225	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	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	90	A
		$T_j = 175^\circ\text{C}$	73	A
I_C	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	106	A
		$T_j = 175^\circ\text{C}$	86	A
I_{Chom}			75	A
I_{CRM}			225	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	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	83	A
		$T_j = 175^\circ\text{C}$	66	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	95	A
		$T_j = 175^\circ\text{C}$	76	A
I_{FRM}			225	A
I_{FSM}	$t_p = 10 \text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$		430	A
T_j			-40 ... 175	$^\circ\text{C}$
Freewheeling - Diode				
V_{RRM}	$T_j = 25^\circ\text{C}$		1200	V
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	83	A
		$T_j = 175^\circ\text{C}$	66	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	95	A
		$T_j = 175^\circ\text{C}$	76	A
I_{FRM}			225	A
I_{FSM}	$t_p = 10 \text{ ms, sin } 180^\circ, T_j = 150^\circ\text{C}$		430	A
T_j			-40 ... 175	$^\circ\text{C}$



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- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

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- Typical motor power 22 kW

Remarks

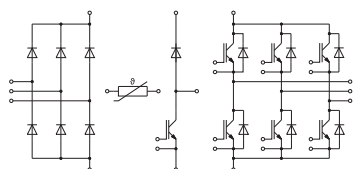
- Max. case temperature limited to $T_C=125^\circ\text{C}$
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Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
Rectifier - Diode				
V_{RRM}	$T_j = 25^\circ\text{C}$	1600	V	
I_F	$\lambda_{paste}=0.8 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	81	A
	$T_j = 150^\circ\text{C}$	$T_s = 70^\circ\text{C}$	60	A
I_F	$\lambda_{paste}=2.5 \text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	92	A
	$T_j = 150^\circ\text{C}$	$T_s = 70^\circ\text{C}$	68	A
I_{FSM}	$t_p = 10 \text{ ms}$	$T_j = 25^\circ\text{C}$	700	A
	$\sin 180^\circ$	$T_j = 150^\circ\text{C}$	490	A
i^2t	$t_p = 10 \text{ ms}$	$T_j = 25^\circ\text{C}$	2450	A^2s
	$\sin 180^\circ$	$T_j = 150^\circ\text{C}$	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	

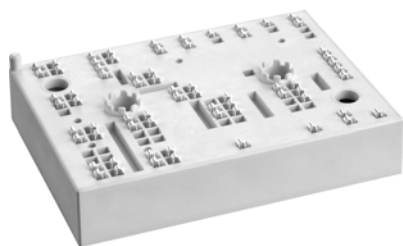
Characteristics

Symbol	Conditions	min.	typ.	max.	Unit
Inverter - IGBT					
$V_{CE(sat)}$	$I_C = 75 \text{ A}$ $V_{GE} = 15 \text{ V}$ 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	$T_j = 25^\circ\text{C}$	14	16	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	21	22	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 3 \text{ mA}$	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}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	4.40		nF
C_{oes}		$f = 1 \text{ MHz}$	0.29		nF
C_{res}		$f = 1 \text{ MHz}$	0.24		nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		425		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		10		Ω
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$ $I_C = 75 \text{ A}$	$T_j = 150^\circ\text{C}$	150		ns
t_r	$R_{G on} = 2 \Omega$	$T_j = 150^\circ\text{C}$	35		ns
E_{on}	$R_{G off} = 2 \Omega$	$T_j = 150^\circ\text{C}$	9.7		mJ
$t_{d(off)}$	$di/dt_{on} = 2400 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	355		ns
t_f	$di/dt_{off} = 355 \text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$	60		ns
E_{off}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	6.8		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		0.58		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		0.44		K/W



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Features*

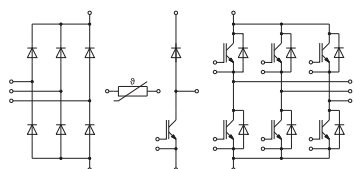
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- UL recognized: File no. E63532

Typical Applications

- Inverter up to 36 kVA
- Typical motor power 22 kW

Remarks

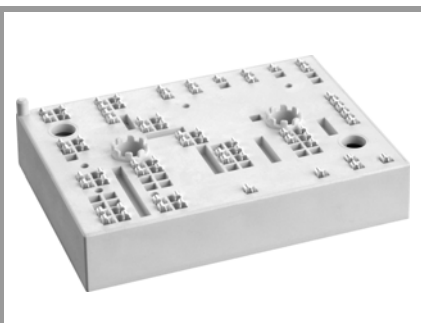
- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Chopper - IGBT						
$V_{CE(sat)}$	$I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}$ 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	$T_j = 25^\circ\text{C}$	14	16		m Ω
		$T_j = 150^\circ\text{C}$	21	22		m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 3\text{ mA}$		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}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	4.40			nF
C_{oes}		$f = 1\text{ MHz}$	0.29			nF
C_{res}		$f = 1\text{ MHz}$	0.24			nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		425			nC
R_{Gint}	$T_j = 25^\circ\text{C}$		10.0			Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 75\text{ A}$	$T_j = 150^\circ\text{C}$	150			ns
t_r	$R_{Gon} = 2\ \Omega$ $R_{Goff} = 2\ \Omega$	$T_j = 150^\circ\text{C}$	35			ns
E_{on}		$T_j = 150^\circ\text{C}$	9.7			mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$	355			ns
t_f		$T_j = 150^\circ\text{C}$	60			ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	6.8			mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$		0.58			K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$		0.44			K/W
Inverse - Diode						
$V_F = V_{EC}$	$I_F = 75\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	2.17	2.49		V
		$T_j = 150^\circ\text{C}$	2.11	2.42		V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$	1.30	1.50		V
		$T_j = 150^\circ\text{C}$	0.90	1.10		V
r_F	chipelevel	$T_j = 25^\circ\text{C}$	12	13		m Ω
		$T_j = 150^\circ\text{C}$	16	18		m Ω
I_{RRM}	$I_F = 75\text{ A}$	$T_j = 150^\circ\text{C}$	62			A
Q_{rr}	$di/dt_{off} = 1940\text{ A}/\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$	12.6			μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	4.9			mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$		0.75			K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$		0.61			K/W
Freewheeling - Diode						
$V_F = V_{EC}$	$I_F = 75\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	2.17	2.49		V
		$T_j = 150^\circ\text{C}$	2.11	2.42		V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$	1.30	1.50		V
		$T_j = 150^\circ\text{C}$	0.90	1.10		V
r_F	chipelevel	$T_j = 25^\circ\text{C}$	12	13		m Ω
		$T_j = 150^\circ\text{C}$	16	18		m Ω
I_{RRM}	$I_F = 75\text{ A}$	$T_j = 150^\circ\text{C}$	62			A
Q_{rr}	$di/dt_{off} = 1940\text{ A}/\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$	12.6			μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	4.9			mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$		0.75			K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$		0.61			K/W

SKiiP 37NAB12T4V1



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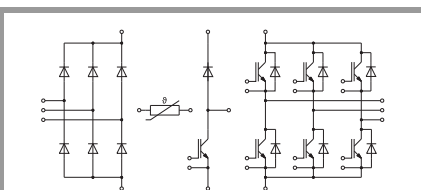
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
$V_F = V_{EC}$	chiplevel	$T_j = 25^\circ\text{C}$		1.00	1.21	V
		$T_j = 125^\circ\text{C}$		0.90	1.10	V
V_{F0}	chiplevel	$T_j = 25^\circ\text{C}$		0.88	0.98	V
		$T_j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



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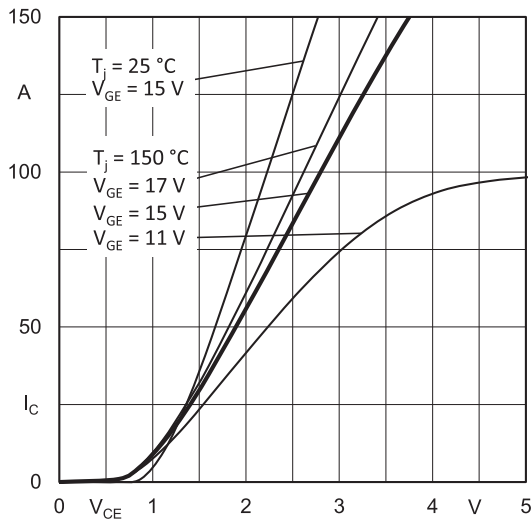


Fig. 1: Typ. output characteristic

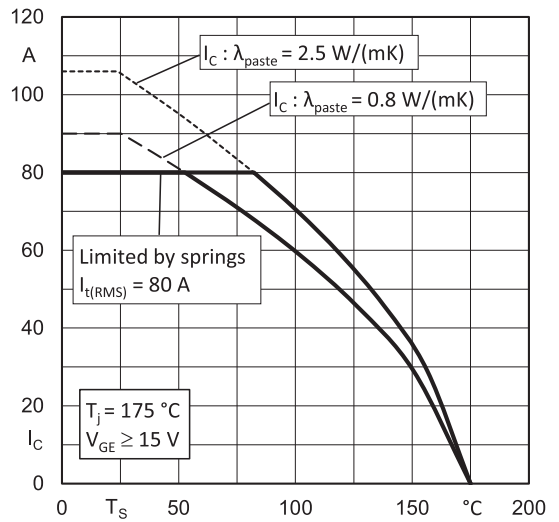


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

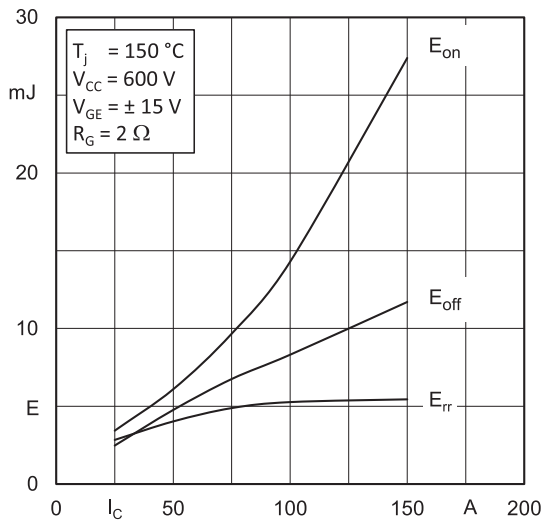


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

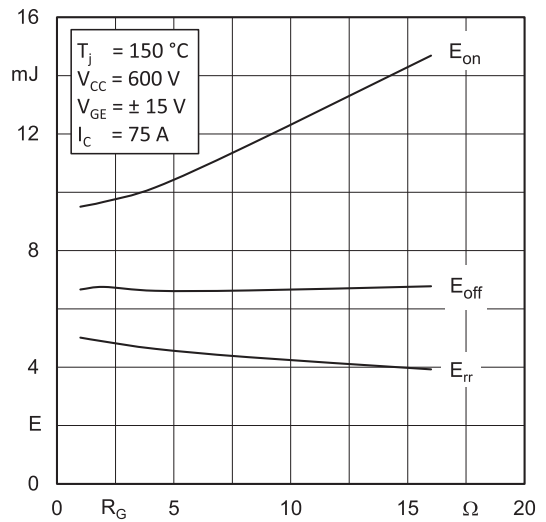


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

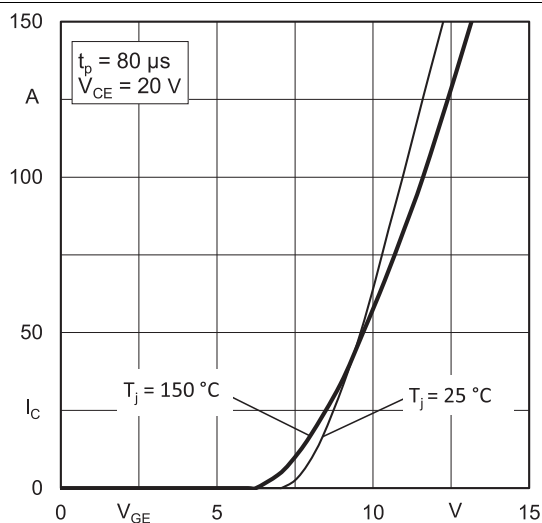


Fig. 5: Typ. transfer characteristic

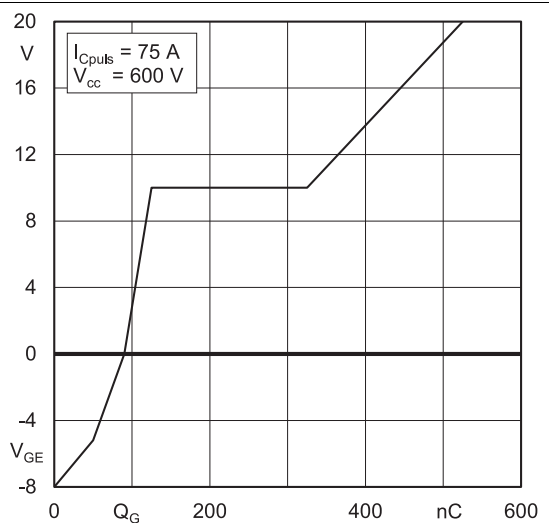
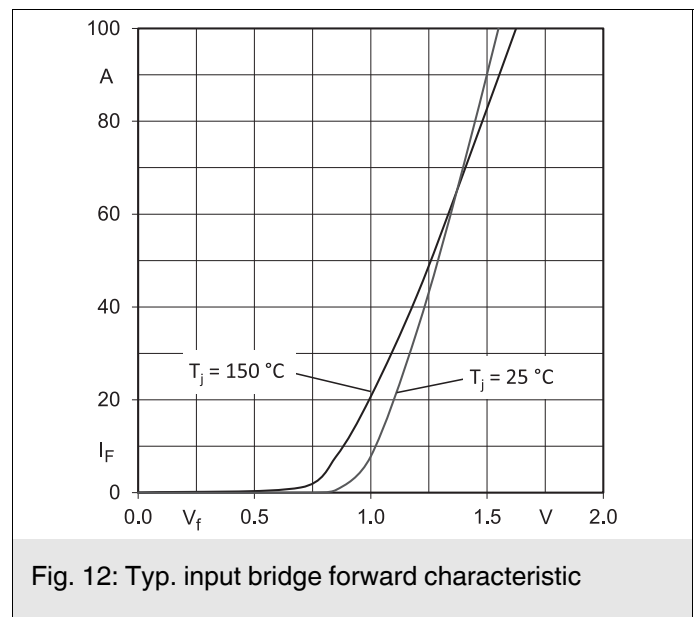
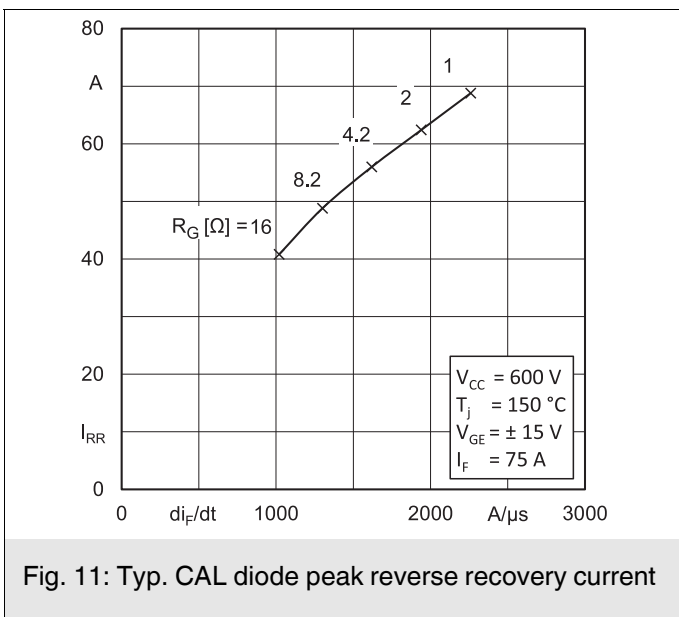
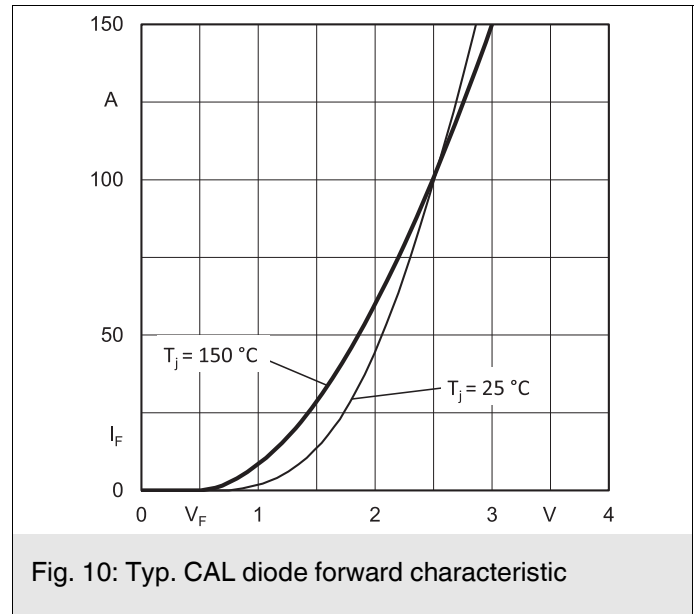
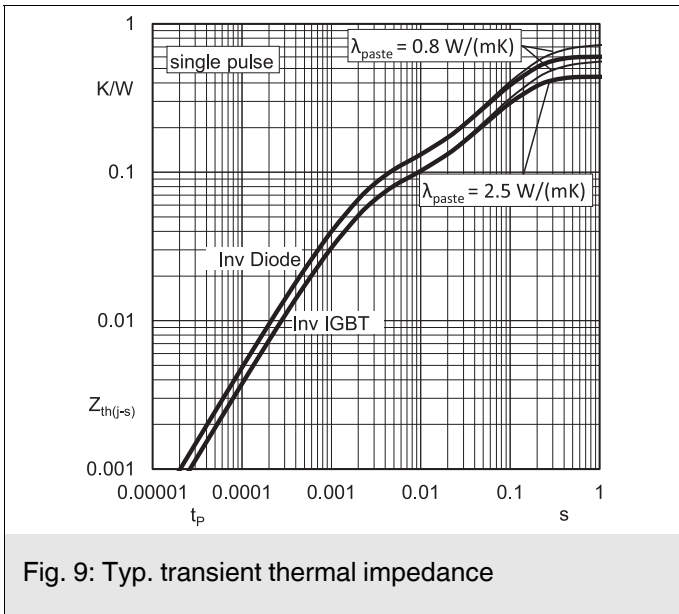
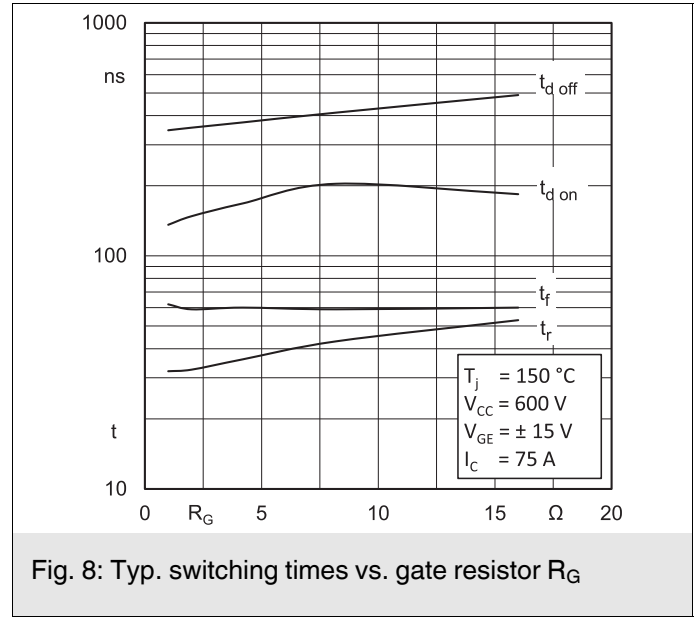
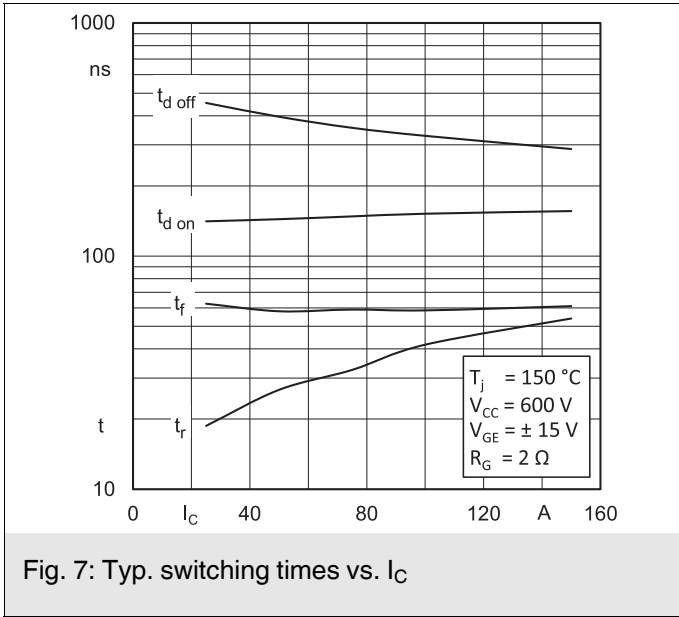
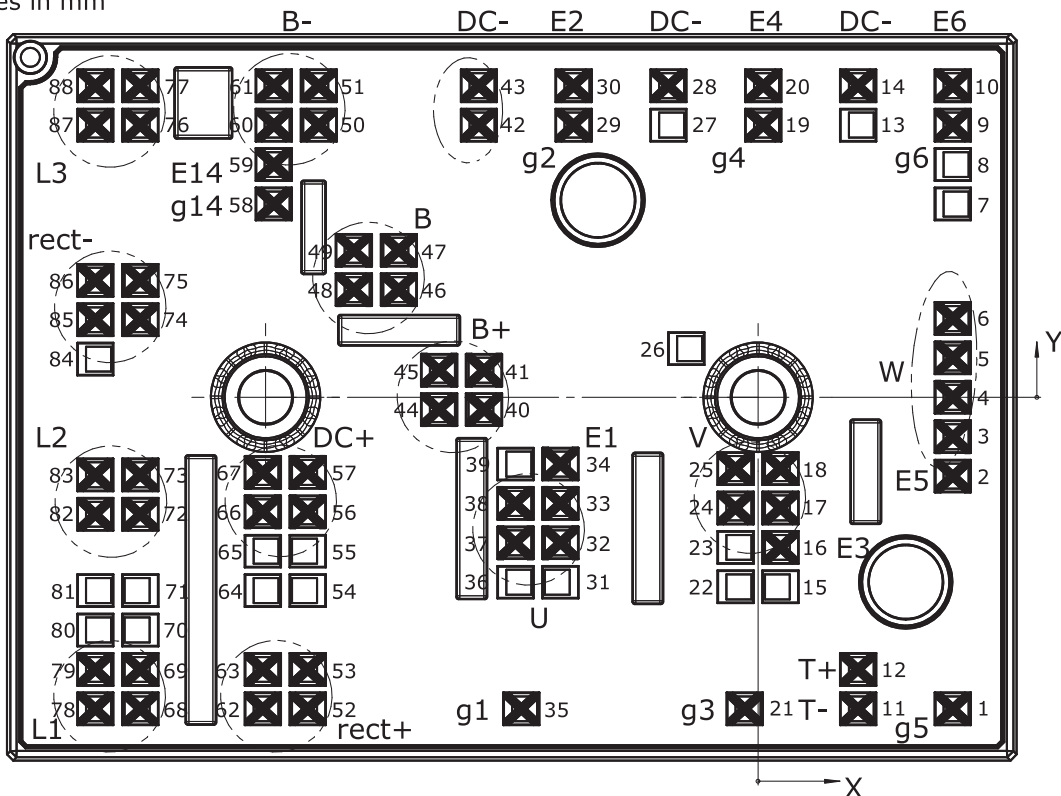


Fig. 6: Typ. gate charge characteristic

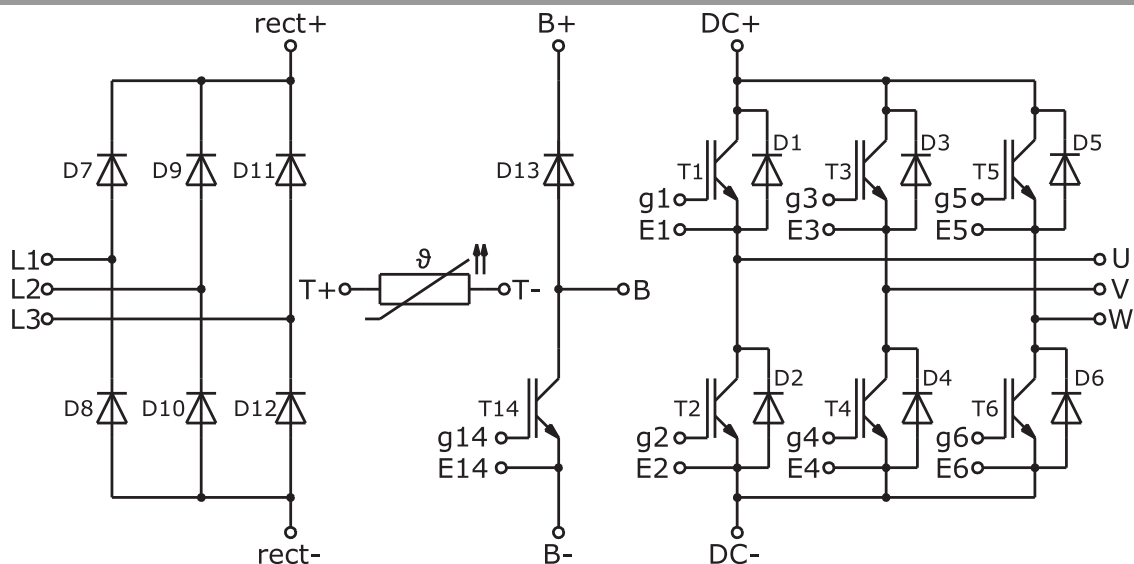


Pin out											
Pin	X	Y	Function	Pin	X	Y	Function	Pin	X	Y	Function
1	15,83	-25,30	g5	31	-16,05	-15,02		61	-39,33	25,30	B-
2	15,83	-6,40	E5	32	-16,05	-11,82	U	62	-40,23	-25,30	rect+
3	15,83	-3,20	W	33	-16,05	-8,62	U	63	-40,23	-22,10	rect+
4	15,83	0	W	34	-16,05	-5,42	E1	64	-40,23	-15,70	
5	15,83	3,20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