

SKiiP 11NAB12T4V1



MiniSKiiP® 1

Converter-Inverter-Brake (CIB)

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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

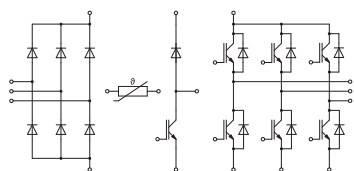
- Inverter up to 8 kVA
- Typical motor power 4 kW

Remarks

- Max. case temperature limited to $T_C=125^\circ\text{C}$
- 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	18	A
	T _j = 175 °C	T _s = 70 °C	14	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	19	A
	T _j = 175 °C	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 _s = 25 °C	18	A
	T _j = 175 °C	T _s = 70 °C	14	A
I _C	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	19	A
	T _j = 175 °C	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 _s = 25 °C	15	A
	T _j = 175 °C	T _s = 70 °C	12	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	17	A
	T _j = 175 °C	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 _s = 25 °C	15	A
	T _j = 175 °C	T _s = 70 °C	12	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	17	A
	T _j = 175 °C	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



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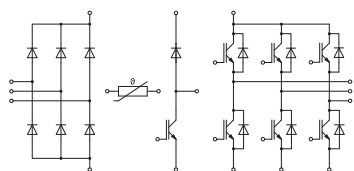
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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
Rectifier - Diode				
V _{RRM}	T _j = 25 °C		1600	V
I _F	λ _{paste} =0.8 W/(mK)	T _s = 25 °C	39	A
	T _j = 150 °C	T _s = 70 °C	29	A
I _F	λ _{paste} =2.5 W/(mK)	T _s = 25 °C	42	A
	T _j = 150 °C	T _s = 70 °C	32	A
I _{FSM}	t _p = 10 ms	T _j = 25 °C	220	A
	sin 180°	T _j = 150 °C	200	A
i ² t	t _p = 10 ms	T _j = 25 °C	242	A ² s
	sin 180°	T _j = 150 °C	200	A ² s
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					
$V_{CE(sat)}$	$I_C = 8 \text{ A}$ $V_{GE} = 15 \text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	V
V_{CE0}	chiplevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V
		$T_j = 150^\circ\text{C}$	0.70	0.80	V
r_{CE}	$V_{GE} = 15 \text{ V}$ chiplevel	$T_j = 25^\circ\text{C}$	131	150	$\text{m}\Omega$
		$T_j = 150^\circ\text{C}$	194	206	$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1 \text{ mA}$	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}	$V_{CE} = 25 \text{ V}$ $V_{GE} = 0 \text{ V}$	$f = 1 \text{ MHz}$	0.49		nF
C_{oes}		$f = 1 \text{ MHz}$	0.05		nF
C_{res}		$f = 1 \text{ MHz}$	0.03		nF
Q_G	$V_{GE} = -8 \text{ V} \dots +15 \text{ V}$		45		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0		Ω
$t_{d(on)}$	$V_{CC} = 600 \text{ V}$ $I_C = 8 \text{ A}$	$T_j = 150^\circ\text{C}$	31		ns
t_r	$R_{G on} = 47 \Omega$	$T_j = 150^\circ\text{C}$	31		ns
E_{on}	$R_{G off} = 47 \Omega$	$T_j = 150^\circ\text{C}$	0.87		mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$	290		ns
t_f		$T_j = 150^\circ\text{C}$	70		ns
E_{off}	$V_{GE} = +15/-15 \text{ V}$	$T_j = 150^\circ\text{C}$	0.74		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8 \text{ W/(mK)}$		1.84		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5 \text{ W/(mK)}$		1.58		K/W



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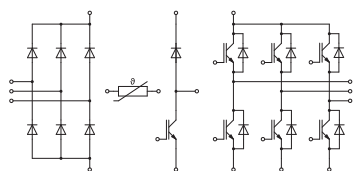
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Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Chopper - IGBT					
$V_{CE(sat)}$	$I_C = 8\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	1.85	2.10	V
		$T_j = 150^\circ\text{C}$	2.25	2.45	V
V_{CE0}	chipelevel	$T_j = 25^\circ\text{C}$	0.80	0.90	V
		$T_j = 150^\circ\text{C}$	0.70	0.80	V
r_{CE}	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	131	150	mΩ
		$T_j = 150^\circ\text{C}$	194	206	mΩ
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1\text{ mA}$	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}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	0.49		nF
C_{oes}		$f = 1\text{ MHz}$	0.05		nF
C_{res}		$f = 1\text{ MHz}$	0.03		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$		45		nC
R_{Gint}	$T_j = 25^\circ\text{C}$		0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 8\text{ A}$	$T_j = 150^\circ\text{C}$	31		ns
t_r	$R_{G\ on} = 47\ \Omega$	$T_j = 150^\circ\text{C}$	31		ns
E_{on}	$R_{G\ off} = 47\ \Omega$	$T_j = 150^\circ\text{C}$	0.87		mJ
$t_{d(off)}$		$T_j = 150^\circ\text{C}$	290		ns
t_f		$T_j = 150^\circ\text{C}$	70		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$	$T_j = 150^\circ\text{C}$	0.74		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W/(mK)}$		1.84		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5\text{ W/(mK)}$		1.58		K/W
Inverse - Diode					
$V_F = V_{EC}$	$I_F = 8\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	2.33	2.65	V
		$T_j = 150^\circ\text{C}$	2.35	2.68	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	$T_j = 25^\circ\text{C}$	129	144	mΩ
		$T_j = 150^\circ\text{C}$	181	198	mΩ
I_{RRM}	$I_F = 8\text{ A}$	$T_j = 150^\circ\text{C}$	8.3		A
Q_{rr}	$di/dt_{off} = 380\text{ A/}\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$	1.35		μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	0.57		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W/(mK)}$		2.53		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W/(mK)}$		2.2		K/W
Freewheeling - Diode					
$V_F = V_{EC}$	$I_F = 8\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$	2.33	2.65	V
		$T_j = 150^\circ\text{C}$	2.35	2.68	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	$T_j = 25^\circ\text{C}$	129	144	mΩ
		$T_j = 150^\circ\text{C}$	181	198	mΩ
I_{RRM}	$I_F = 8\text{ A}$	$T_j = 150^\circ\text{C}$	8.3		A
Q_{rr}	$di/dt_{off} = 380\text{ A/}\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$	1.35		μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$	0.57		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W/(mK)}$		2.53		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W/(mK)}$		2.2		K/W

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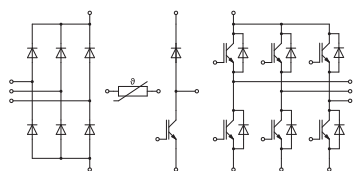
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Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Rectifier - Diode						
V _F = V _{EC}	I _F = 8 A	T _j = 25 °C		1.00	1.21	V
	chipelevel	T _j = 125 °C		0.90	1.10	V
V _{F0}	chipelevel	T _j = 25 °C		0.88	0.98	V
		T _j = 125 °C		0.73	0.83	V
r _F	chipelevel	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					



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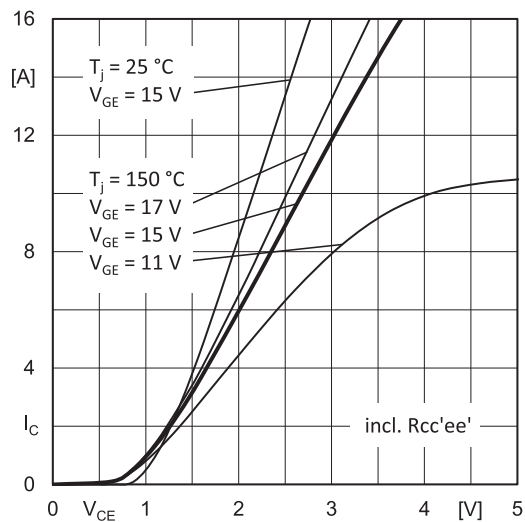


Fig. 1: Typ. output characteristic

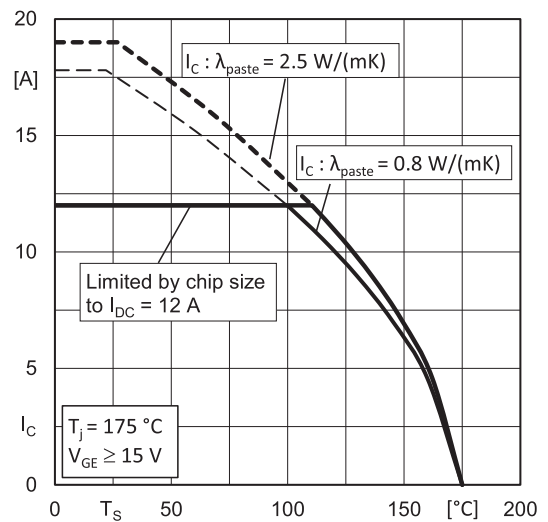


Fig. 2: Typ. rated current vs. temperature $I_C = f(T_s)$

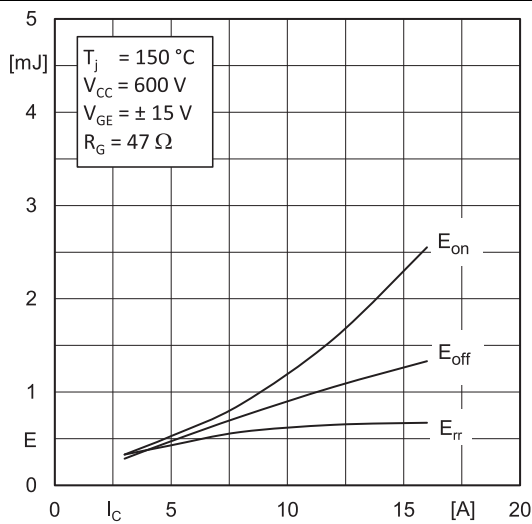


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

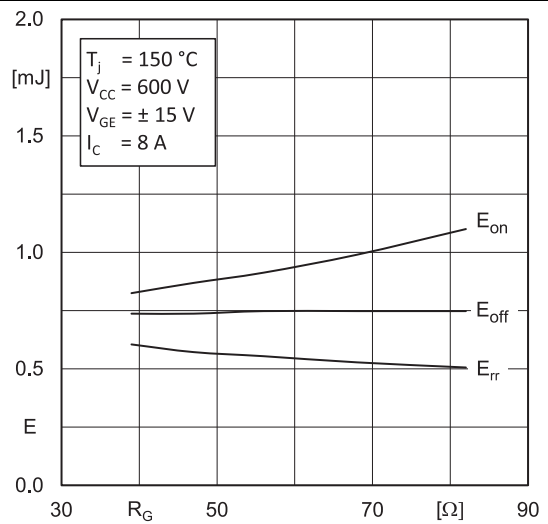


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

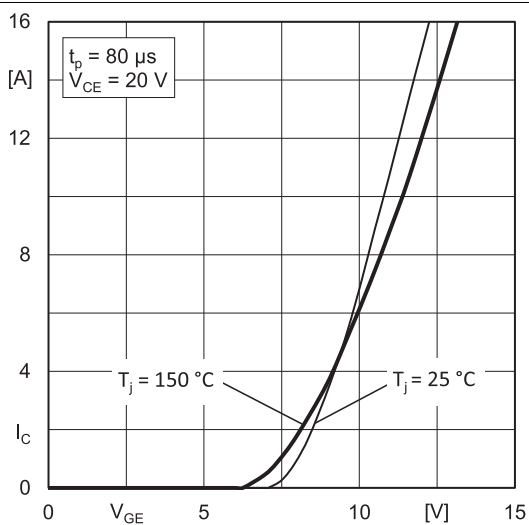


Fig. 5: Typ. transfer characteristic

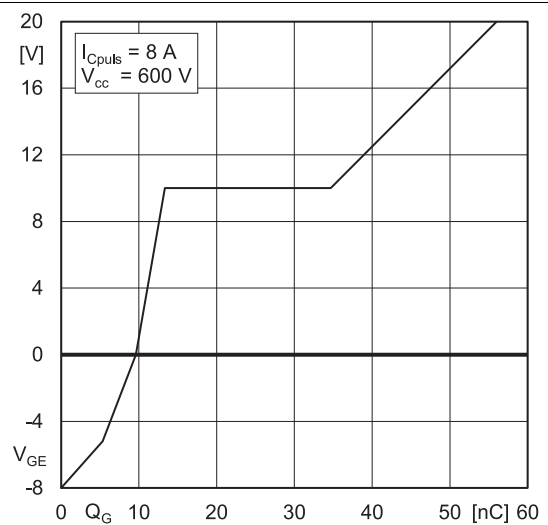
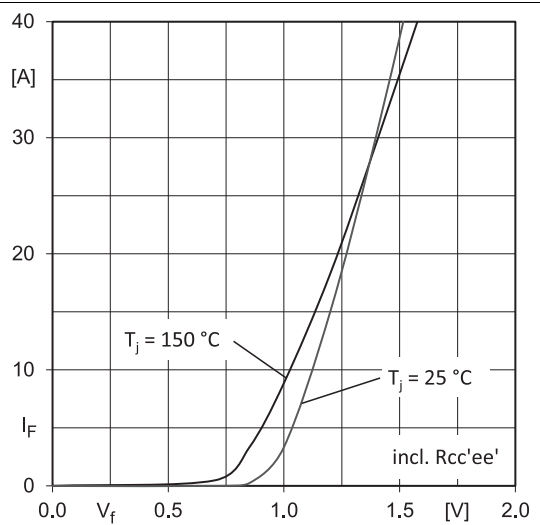
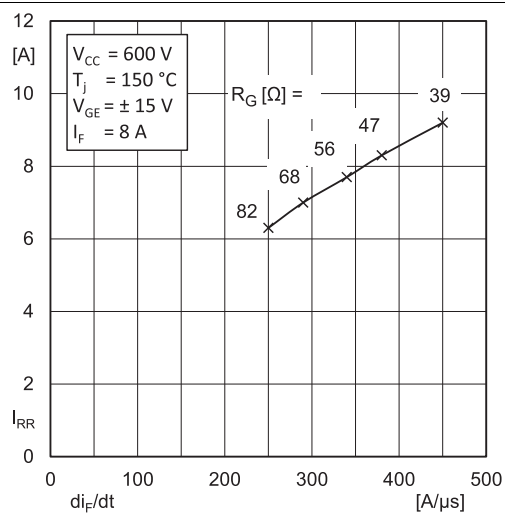
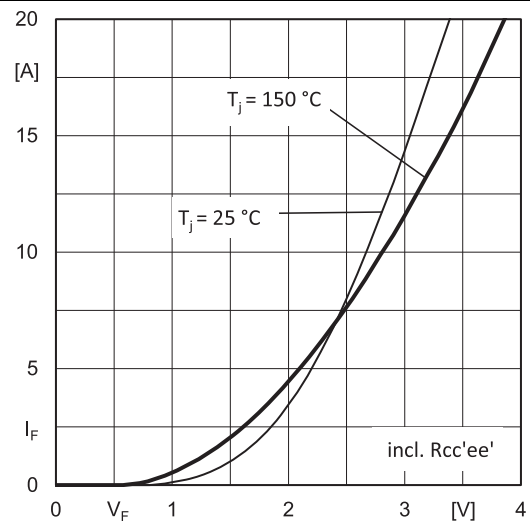
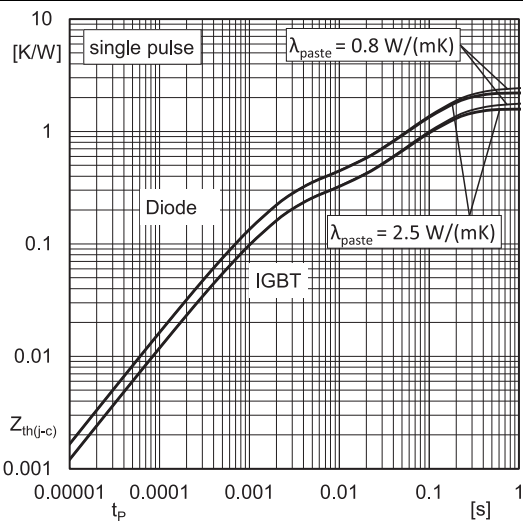
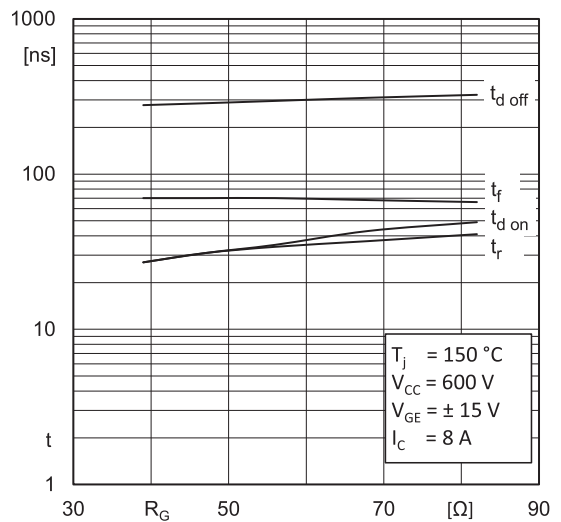
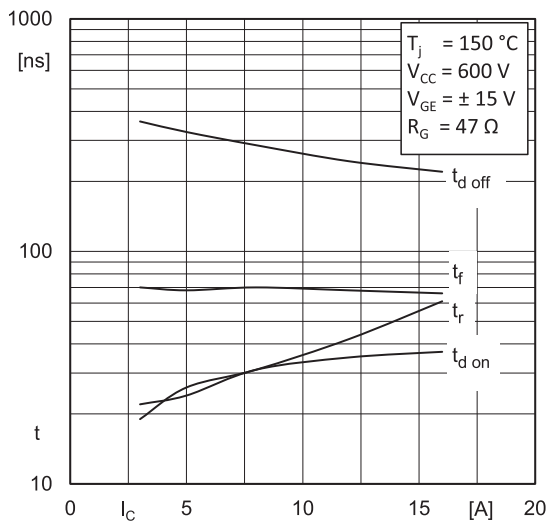
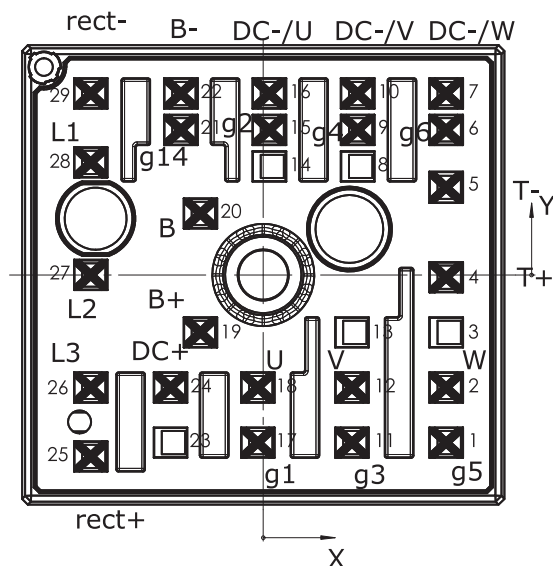


Fig. 6: Typ. gate charge characteristic

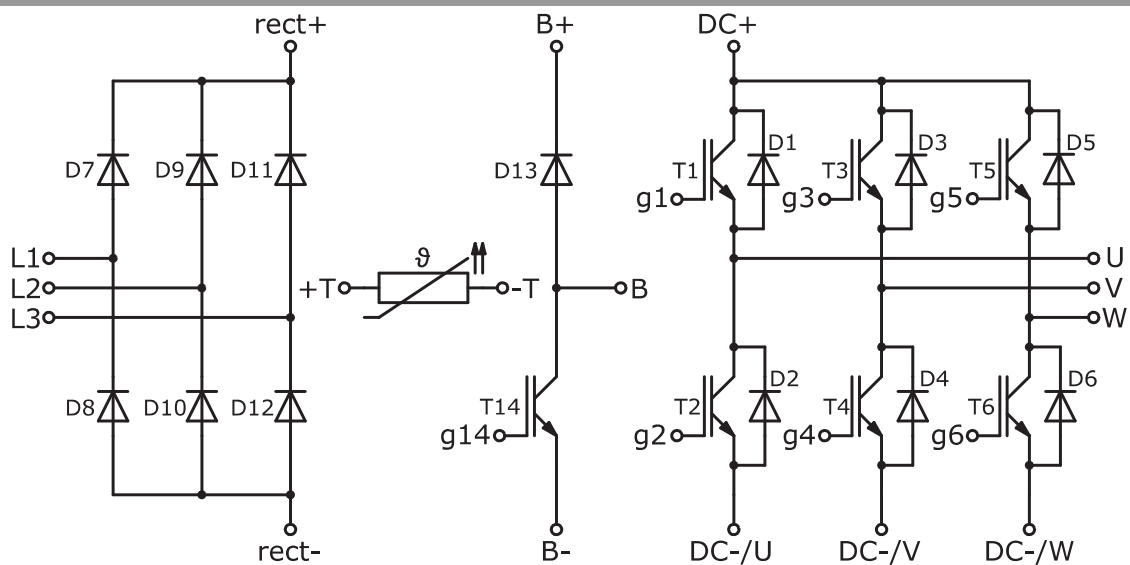


Pin out							
Pin	X	Y	Function	Pin	X	Y	Function
1	15,93	-14,60	g5	16	0,53	15,80	DC-/U
2	15,93	-9,80	W	17	-0,48	-14,6	g1
3	15,93	-5,00		18	-0,48	-9,80	U
4	15,93	-0,20	T+	19	-5,48	-5,00	B+
5	15,93	7,63	T-	20	-5,48	5,35	B
6	15,93	12,63	g6	21	-7,18	12,63	g14
7	15,93	15,80	DC-/W	22	-7,18	15,80	B-
8	8,23	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**

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