

SKiiP 23ACC12T4V10



MiniSKiiP® 2

Twin 6-pack

SKiiP 23ACC12T4V10

Features

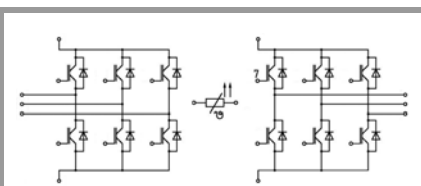
- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Typical Applications*

- 4Q inverters

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 $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Terminal distances sufficient for basic insulation in 3-phase 480VAC TN systems
- DC-link voltage $V_{DC} \leq 800\text{V}$
- Temperature sensor: no basic insulation to main circuit, signal processing with reference to -DC potential
- Please refer to MiniSKiiP "Technical Explanations" and "Mounting Instructions" for further information



ACC

Absolute Maximum Ratings

Symbol	Conditions	Values	Unit	
IGBT 1 - 6				
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V	
I_C	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	28	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	23	A
I_C	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	31	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	26	A
I_{Cnom}		15	A	
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	45	A	
V_{GES}		-20 ... 20	V	
t_{psc}	$V_{CC} = 800\text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
	$V_{GE} \leq 15\text{ V}$			
	$V_{CES} \leq 1200\text{ V}$			
T_j		-40 ... 175	$^\circ\text{C}$	
IGBT 7 - 12				
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V	
I_C	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	41	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	34	A
I_C	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	45	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	37	A
I_{Cnom}		25	A	
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	75	A	
V_{GES}		-20 ... 20	V	
t_{psc}	$V_{CC} = 800\text{ V}$	$T_j = 150^\circ\text{C}$	10	μs
	$V_{GE} \leq 15\text{ V}$			
	$V_{CES} \leq 1200\text{ V}$			
T_j		-40 ... 175	$^\circ\text{C}$	
Diode 1 - 6				
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V	
I_F	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	23	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	19	A
I_F	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	25	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	20	A
I_{Fnom}		15	A	
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	45	A	
I_{FSM}	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	65	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Diode 7 - 12				
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V	
I_F	$\lambda_{paste}=0.8\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	32	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	26	A
I_F	$\lambda_{paste}=2.5\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	35	A
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	28	A
I_{Fnom}		25	A	
I_{FRM}	$I_{FRM} = 3 \times I_{Fnom}$	75	A	
I_{FSM}	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	100	A	
T_j		-40 ... 175	$^\circ\text{C}$	
Module				
$I_{t(RMS)}$	20 A per spring	40	A	
T_{stg}		-40 ... 125	$^\circ\text{C}$	
V_{isol}	AC sinus 50 Hz, 1 min	2500	V	

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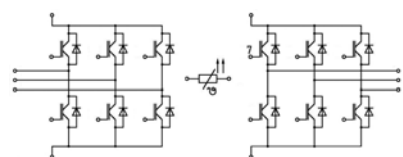
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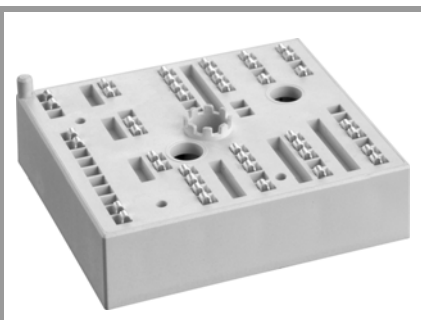
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- Product reliability results valid for $T_j \leq 150^\circ\text{C}$ (recommended $T_{j,op} = -40 \dots +150^\circ\text{C}$)
- Terminal distances sufficient for basic insulation in 3-phase 480VAC TN systems
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ACC

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1 - 6						
$V_{CE(sat)}$	$I_C = 15\text{ A}$ $V_{GE} = 15\text{ V}$ 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
$V_{GE(th)}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$		0.1	0.3	mA
						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}	$T_j = 25^\circ\text{C}$			0.0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 15\text{ A}$	$T_j = 150^\circ\text{C}$		78		ns
t_r	$R_{G\ on} = 39\ \Omega$ $R_{G\ off} = 39\ \Omega$	$T_j = 150^\circ\text{C}$		64		ns
E_{on}	$R_{G\ on} = 39\ \Omega$ $R_{G\ off} = 39\ \Omega$	$T_j = 150^\circ\text{C}$		1.89		mJ
$t_{d(off)}$	$di/dt_{on} = 200\text{ A}/\mu\text{s}$ $di/dt_{off} = 189\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		340		ns
t_f	$du/dt = 3600\text{ V}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		67		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$ $L_s = 22\text{ nH}$	$T_j = 150^\circ\text{C}$		1.64		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			1.3		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			1.1		K/W
IGBT 7 - 12						
$V_{CE(sat)}$	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ 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	$T_j = 25^\circ\text{C}$		42	48	m Ω
		$T_j = 150^\circ\text{C}$		62	66	m Ω
$V_{GE(th)}$	$V_{GE} = V_{CE}\text{ V}, I_C = 1\text{ mA}$		5	5.8	6.5	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25^\circ\text{C}$		0.1	0.3	mA
				-		mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		1.43		nF
C_{oes}		$f = 1\text{ MHz}$		0.12		nF
C_{res}		$f = 1\text{ MHz}$		0.09		nF
Q_G	$V_{GE} = -8\text{ V} \dots +15\text{ V}$			142		nC
R_{Gint}	$T_j = 25^\circ\text{C}$			0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 25\text{ A}$	$T_j = 150^\circ\text{C}$		87		ns
t_r	$R_{G\ on} = 39\ \Omega$ $R_{G\ off} = 39\ \Omega$	$T_j = 150^\circ\text{C}$		61		ns
E_{on}	$R_{G\ on} = 39\ \Omega$ $R_{G\ off} = 39\ \Omega$	$T_j = 150^\circ\text{C}$		3.5		mJ
$t_{d(off)}$	$di/dt_{on} = 325\text{ A}/\mu\text{s}$ $di/dt_{off} = 330\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		400		ns
t_f	$du/dt = 3500\text{ V}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		61		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$ $L_s = 22\text{ nH}$	$T_j = 150^\circ\text{C}$		2.7		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			1		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			0.84		K/W

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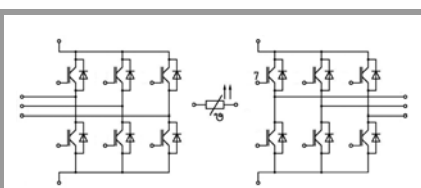
Typical Applications*

- 4Q inverters

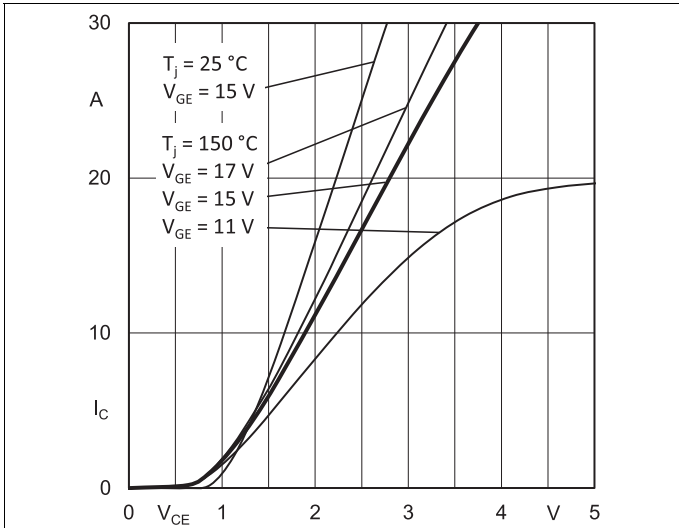
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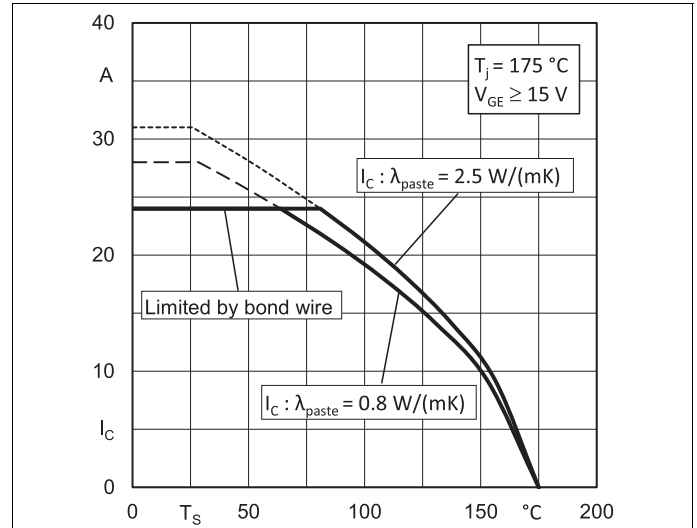
Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 1 - 6						
$V_F = V_{EC}$	$I_F = 15\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.38	2.71	V
		$T_j = 150^\circ\text{C}$		2.44	2.77	V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1.30	1.50	V
		$T_j = 150^\circ\text{C}$		0.90	1.10	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$		72	81	m Ω
		$T_j = 150^\circ\text{C}$		103	111	m Ω
I_{RRM}	$I_F = 15\text{ A}$	$T_j = 150^\circ\text{C}$		10.7		A
Q_{rr}	$di/dt_{off} = 260\text{ A}/\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		2.2		μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		0.72		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			1.92		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			1.7		K/W
Diode 7 - 12						
$V_F = V_{EC}$	$I_F = 25\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		2.41	2.74	V
		$T_j = 150^\circ\text{C}$		2.45	2.79	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	$T_j = 25^\circ\text{C}$		44	50	m Ω
		$T_j = 150^\circ\text{C}$		62	68	m Ω
I_{RRM}	$I_F = 25\text{ A}$	$T_j = 150^\circ\text{C}$		13.8		A
Q_{rr}	$di/dt_{off} = 320\text{ A}/\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		3.3		μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		1.15		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			1.52		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			1.3		K/W
Module						
L_{CE}				30		nH
M_s	to heat sink		2		2.5	Nm
w				55		g
Temperature Sensor						
R_{100}	$T_r=100^\circ\text{C}$ ($R_{25}=1000\Omega$)			$1670 \pm 3\%$		Ω
$R(T)$	$R(T)=1000\Omega[1+A(T-25^\circ\text{C})+B(T-25^\circ\text{C})^2]$ $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$, $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					



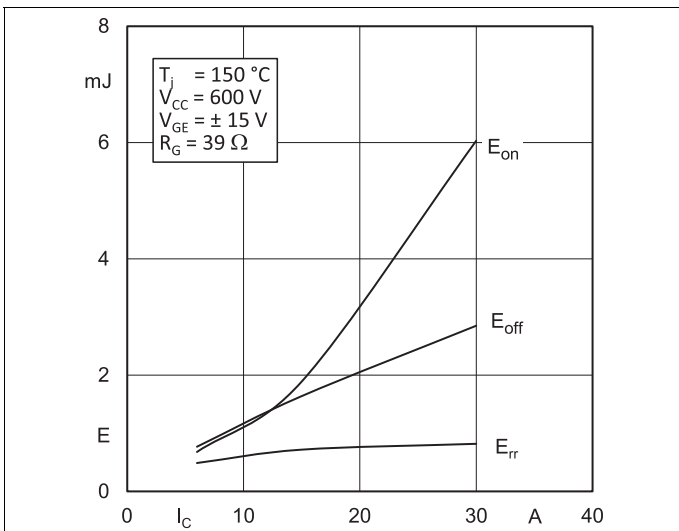
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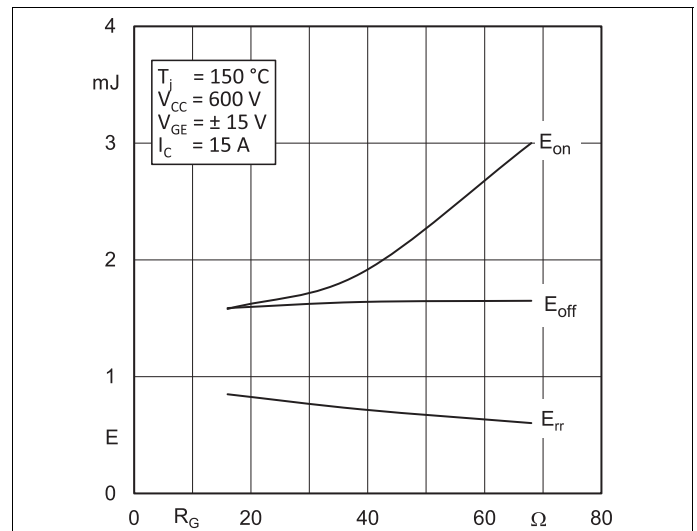
IGBT 1-6 - Fig. 1:
Typ. output characteristic



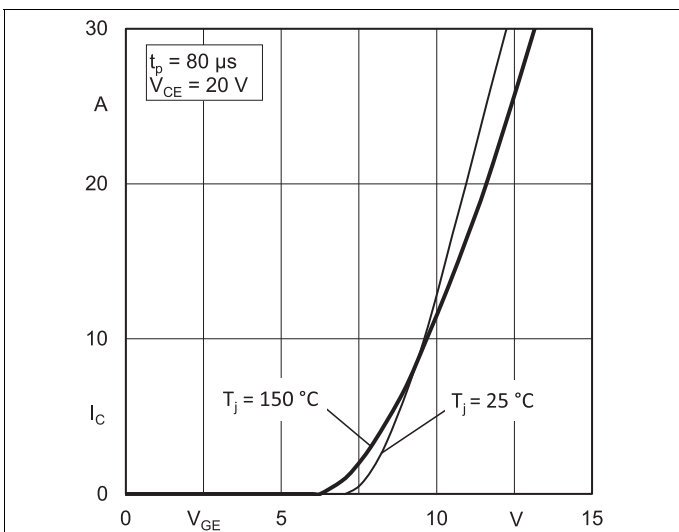
IGBT 1-6 - Fig. 2:
Typ. rated current vs. temperature $I_C = f(T_s)$



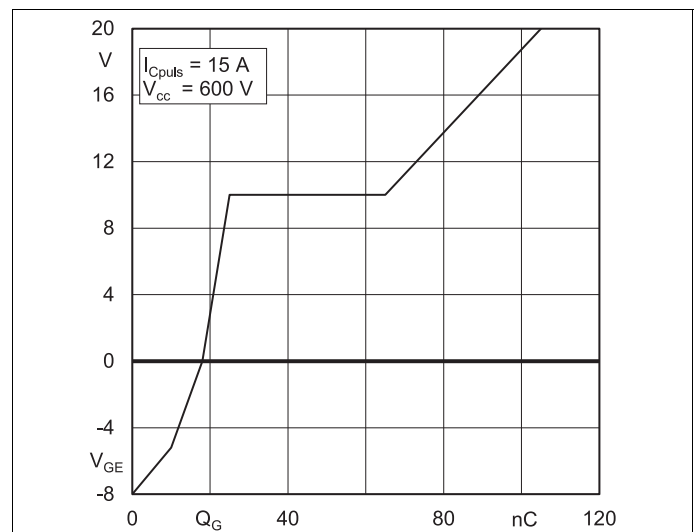
IGBT 1-6 - Fig. 3:
Typ. turn-on /-off energy = $f(I_C)$



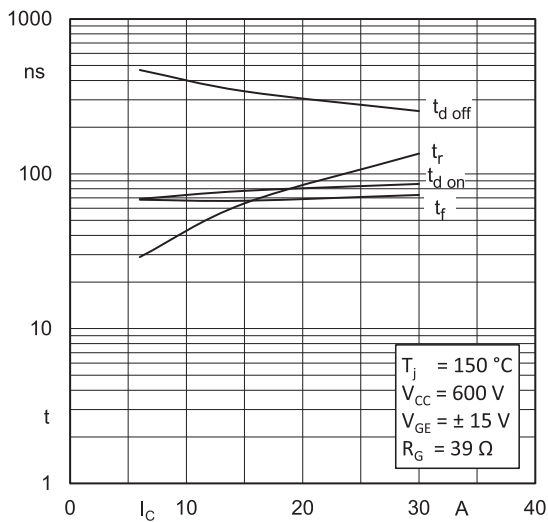
IGBT 1-6 - Fig. 4:
Typ. turn-on /-off energy = $f(R_G)$



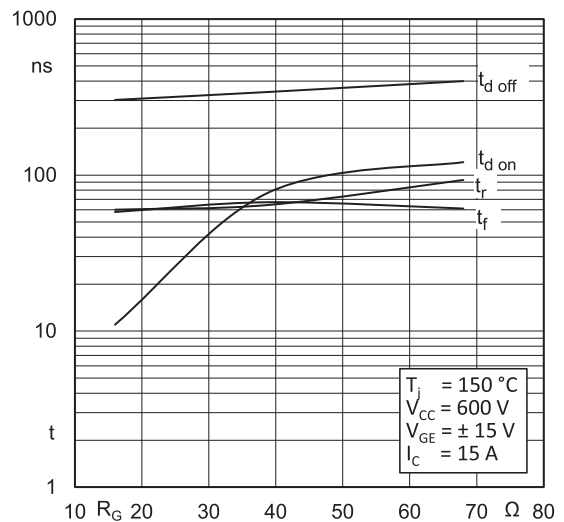
IGBT 1-6 - Fig. 5:
Typ. transfer characteristic



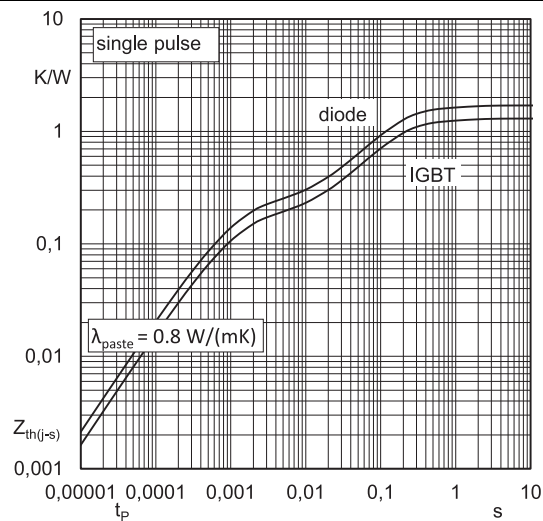
IGBT 1-6 - Fig. 6:
Typ. gate charge characteristic



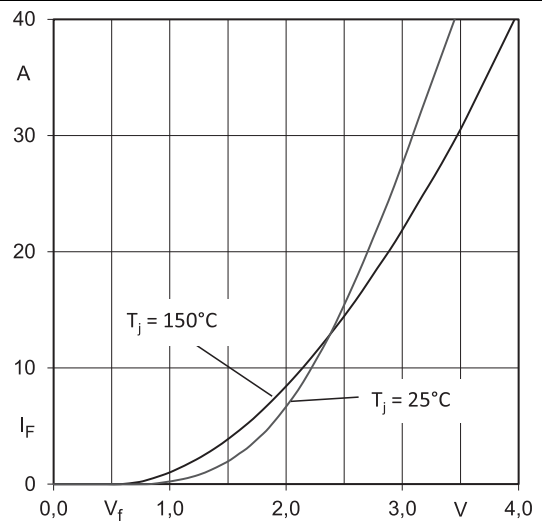
IGBT 1-6 - Fig. 7:
Typ. switching times vs. I_C



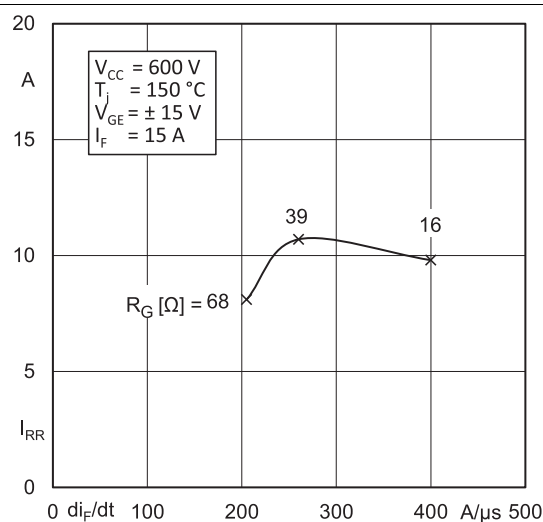
IGBT 1-6 - Fig. 8:
Typ. switching times vs. gate resistor R_G



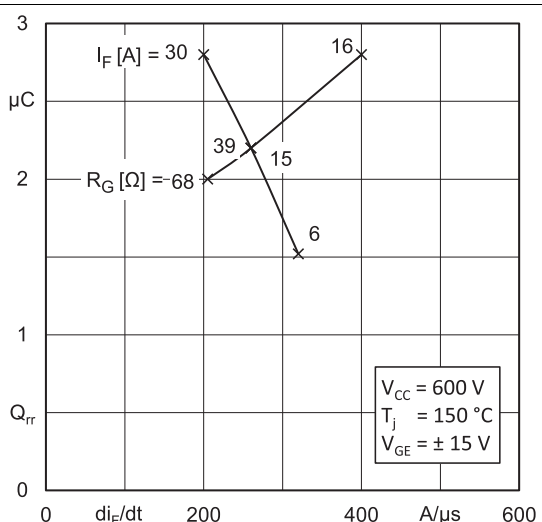
IGBT 1-6 - Fig. 9:
Transient thermal impedance of IGBT and Diode



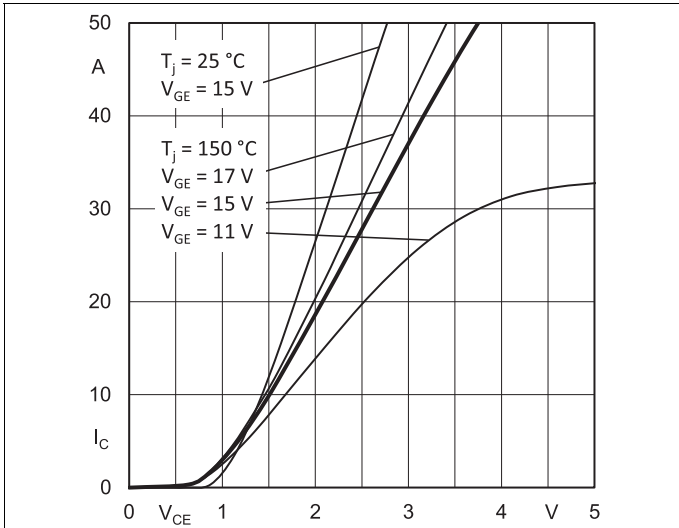
IGBT 1-6 - Fig. 10:
CAL diode forward characteristic



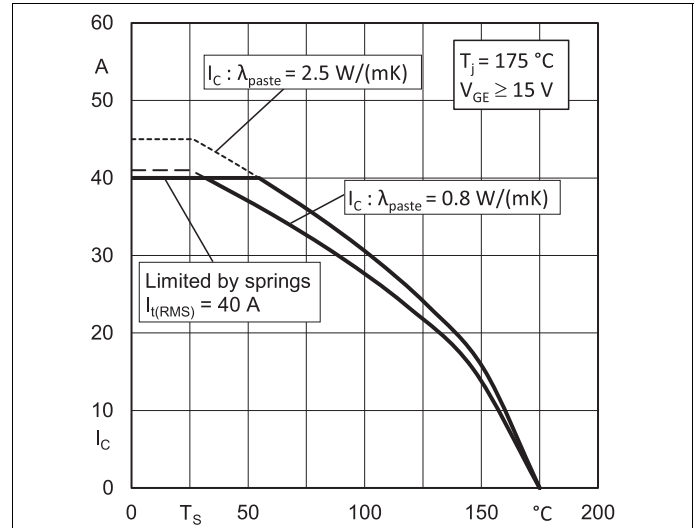
IGBT 1-6 - Fig. 11:
Typ. CAL diode peak reverse recovery current



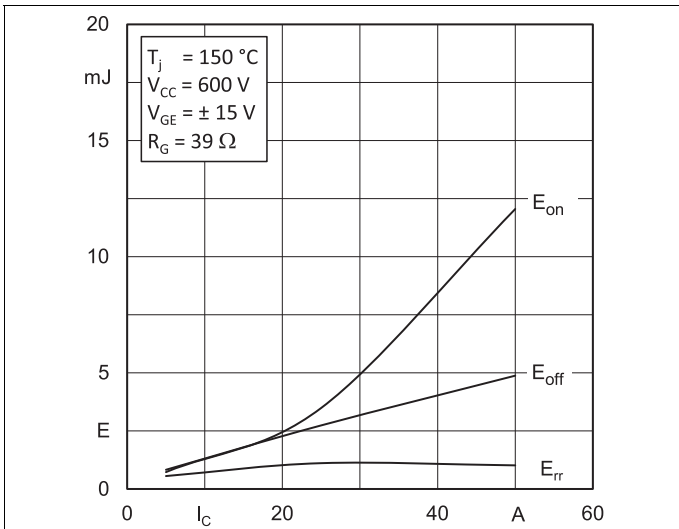
IGBT 1-6 - Fig. 12:
Typ. CAL diode recovery charge



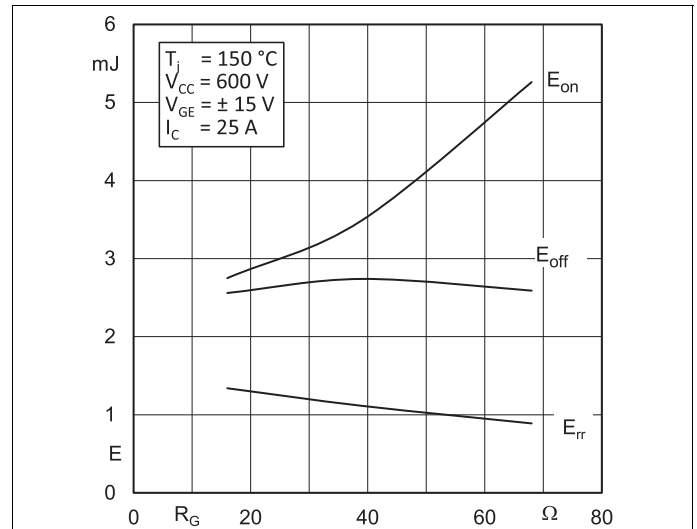
IGBT 7-12 - Fig. 1:
Typ. output characteristic



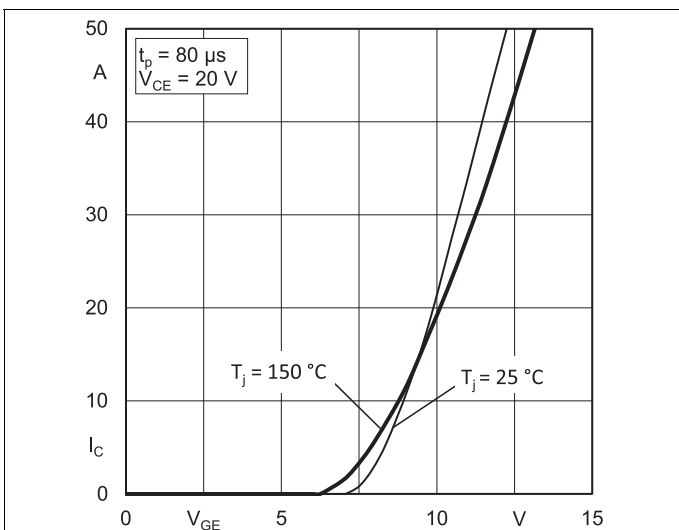
IGBT 7-12 - Fig. 2:
Typ. rated current vs. temperature $I_C = f(T_S)$



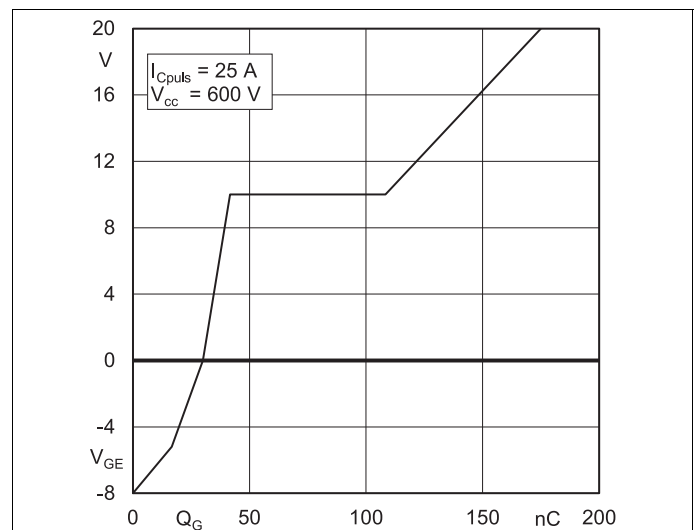
IGBT 7-12 - Fig. 3:
Typ. turn-on /-off energy = $f(I_C)$



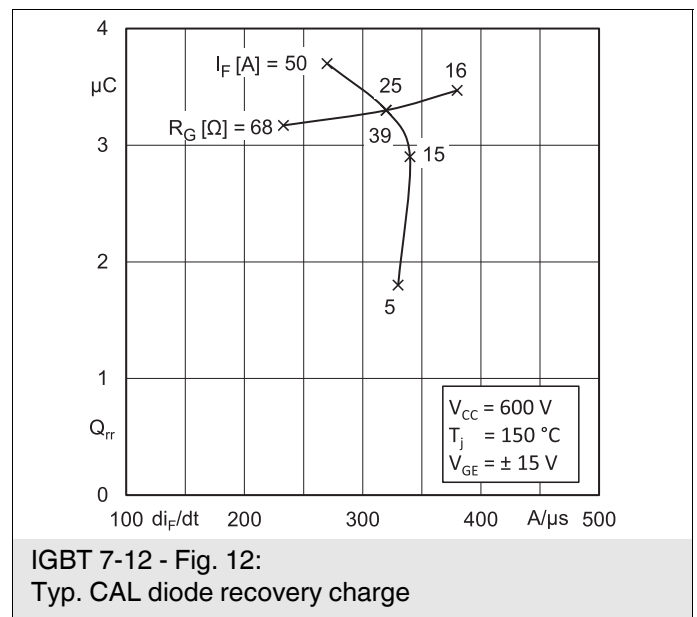
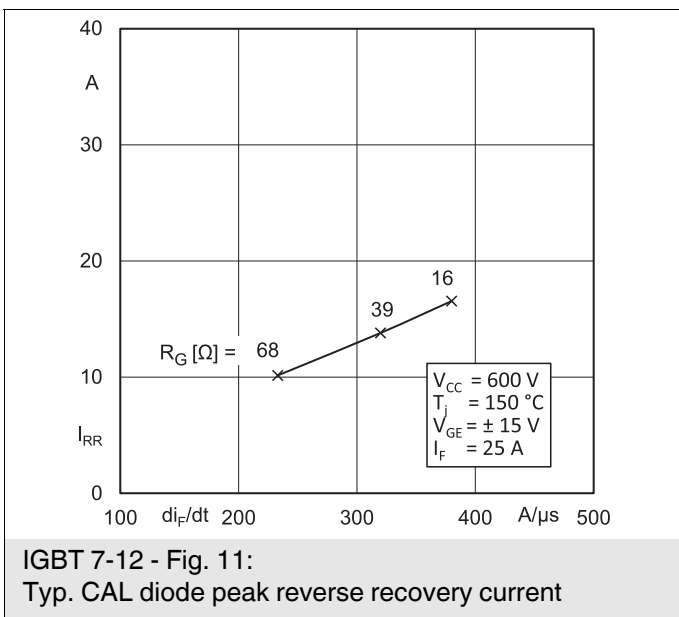
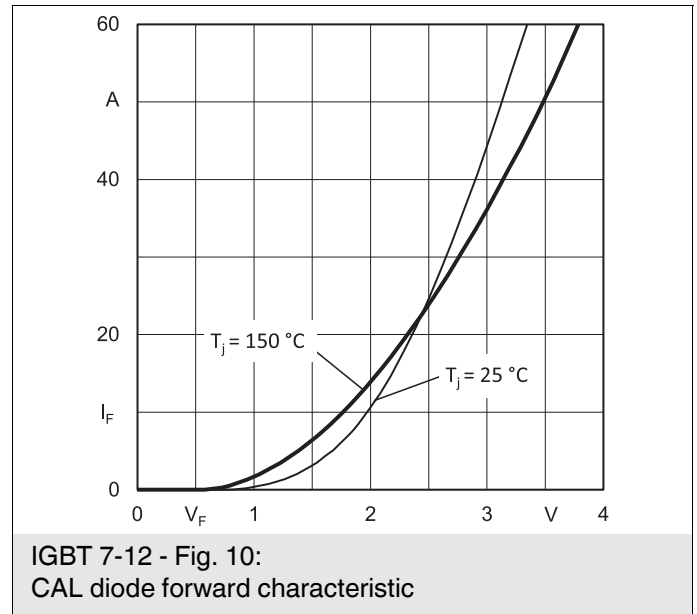
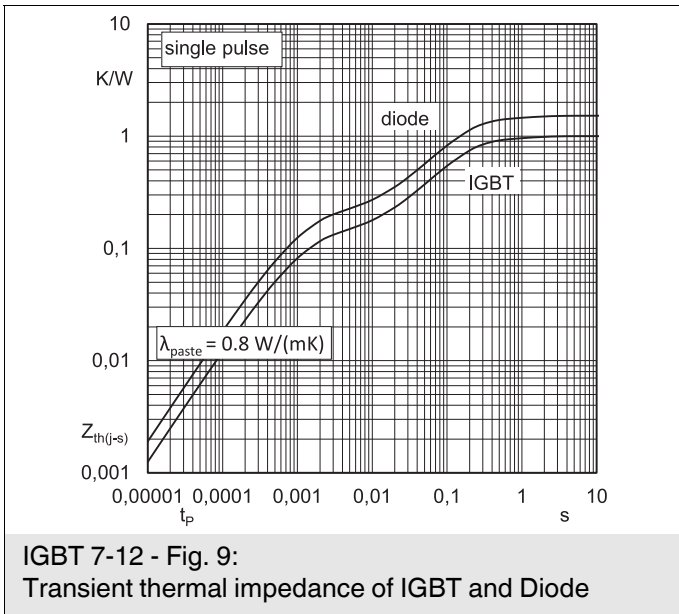
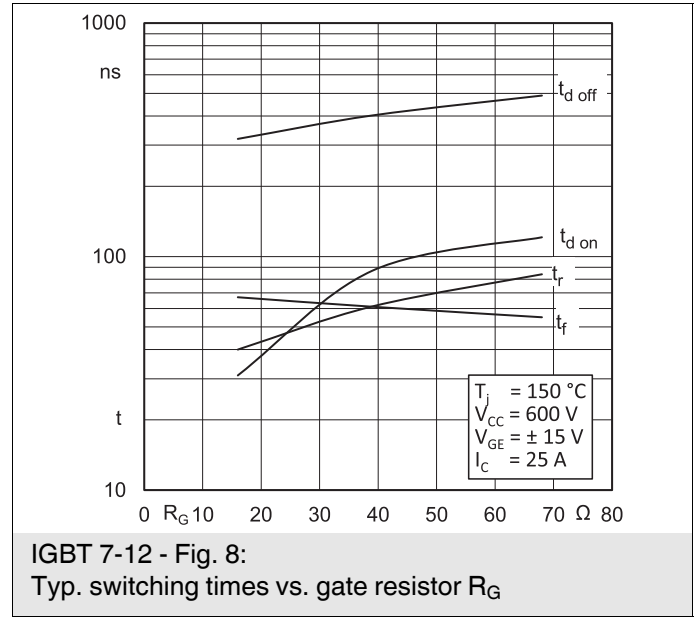
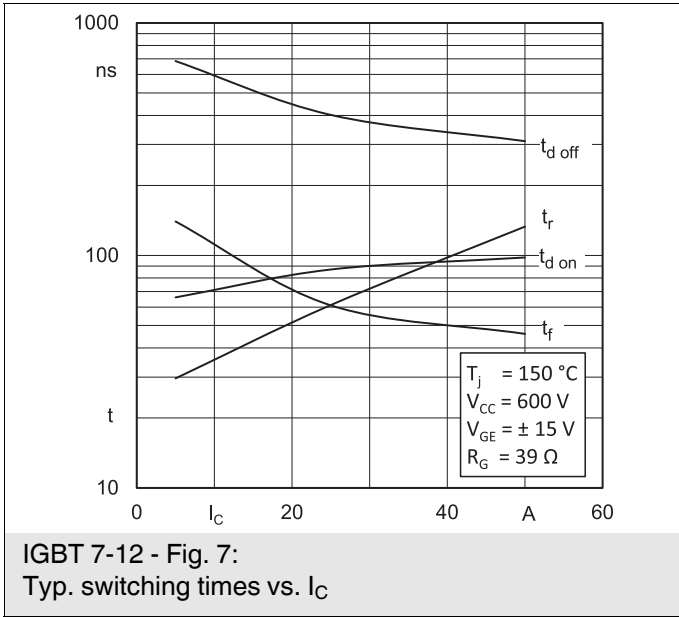
IGBT 7-12 - Fig. 4:
Typ. turn-on /-off energy = $f(R_G)$



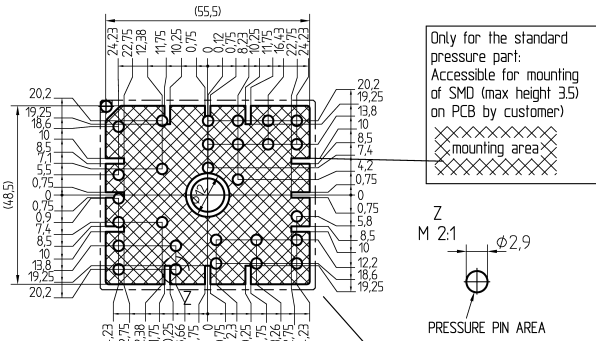
IGBT 7-12 - Fig. 5:
Typ. transfer characteristic



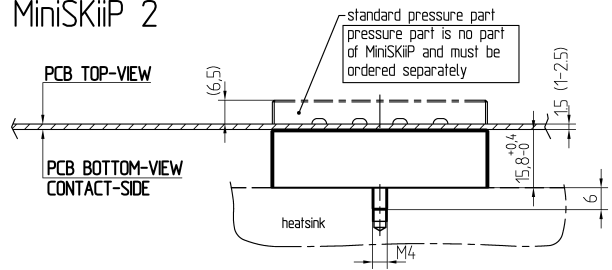
IGBT 7-12 - Fig. 6:
Typ. gate charge characteristic



PCB PCB TOP-VIEW

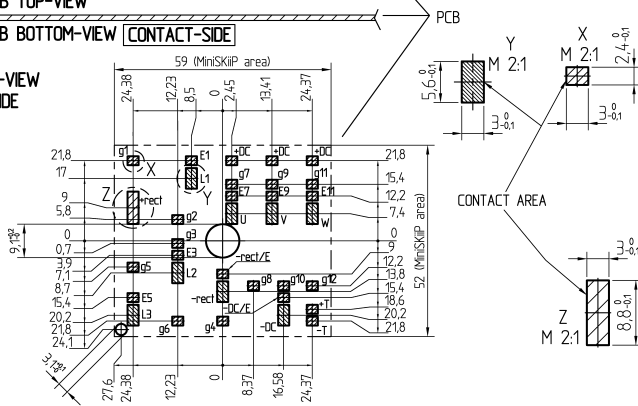


MiniSKiiP 2

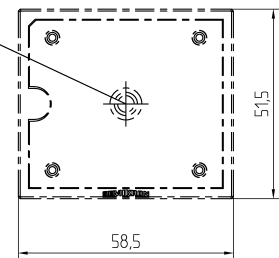


PCB TOP-VIEW PCB BOTTOM-VIEW CONTACT-SIDE

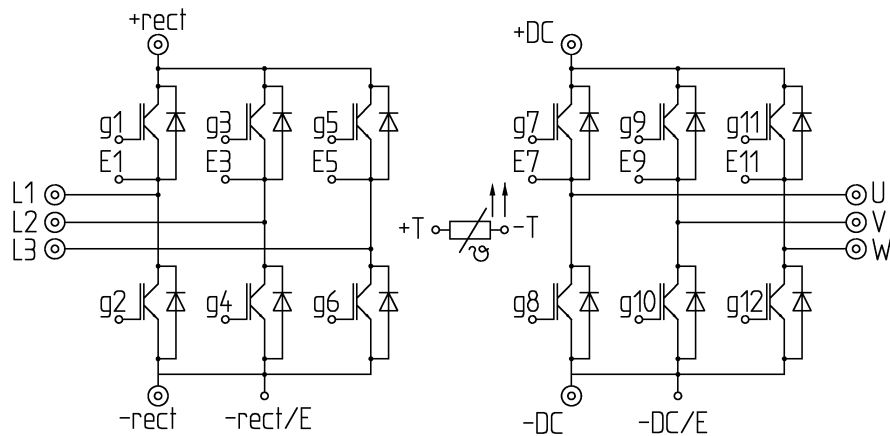
PCB BOTTOM-VIEW CONTACT-SIDE



For mounting please follow the assembly instruction



pinout, dimensions



- ⊙ power connector
- control connector

pinout

This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, chapter IX.

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