

SKiiP 12ACC12T4V10



MiniSKiiP® 1

Twin 6-pack

SKiiP 12ACC12T4V10

Features

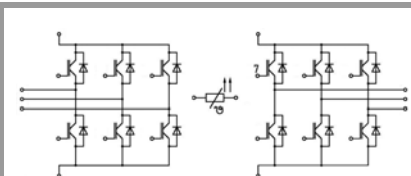
- Trench 4 IGBTs
- Robust and soft freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognised: File no. E63532

Typical Applications*

- 4Q inverters

Remarks

- Max. case temperature limited to $T_C=125^\circ\text{C}$
- Terminal distances sufficient for basic insulation in 3-phase 480VAC TN systems
- DC-link voltage $V_{DC}\leq 800\text{V}$
- Max. 500V potential difference between +rect and +DC
- Max. 500V potential difference between -rect and -DC
- 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	$\lambda_{\text{paste}}=0.8\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	18
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	15
I_C	$\lambda_{\text{paste}}=2.5\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	19
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	16
I_{Cnom}		8	A
I_{CRM}	$I_{CRM} = 3 \times I_{Cnom}$	24	A
V_{GES}		-20 ... 20	V
t_{psc}	$V_{CC} = 800\text{ V}$	$T_j = 150^\circ\text{C}$	10
	$V_{GE} \leq 15\text{ V}$		
	$V_{CES} \leq 1200\text{ V}$		
T_j		-40 ... 175	$^\circ\text{C}$
IGBT 7 - 12			
V_{CES}	$T_j = 25^\circ\text{C}$	1200	V
I_C	$\lambda_{\text{paste}}=0.8\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	28
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	23
I_C	$\lambda_{\text{paste}}=2.5\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	31
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	26
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
	$V_{GE} \leq 15\text{ V}$		
	$V_{CES} \leq 1200\text{ V}$		
T_j		-40 ... 175	$^\circ\text{C}$
Diode 1 - 6			
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V
I_F	$\lambda_{\text{paste}}=0.8\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	14
	$T_j = 150^\circ\text{C}$	$T_s = 70^\circ\text{C}$	11
I_F	$\lambda_{\text{paste}}=2.5\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	15
	$T_j = 150^\circ\text{C}$	$T_s = 70^\circ\text{C}$	12
I_{Fnom}		8	A
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$	16	A
I_{FSM}	10 ms, sin 180°, $T_j = 150^\circ\text{C}$	55	A
T_j		-40 ... 150	$^\circ\text{C}$
Diode 7 - 12			
V_{RRM}	$T_j = 25^\circ\text{C}$	1200	V
I_F	$\lambda_{\text{paste}}=0.8\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	23
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	18
I_F	$\lambda_{\text{paste}}=2.5\text{ W/(mK)}$	$T_s = 25^\circ\text{C}$	24
	$T_j = 175^\circ\text{C}$	$T_s = 70^\circ\text{C}$	20
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	$^\circ\text{C}$
Module			
$I_{t(RMS)}$	20 A per spring	20	A
T_{stg}		-40 ... 125	$^\circ\text{C}$
V_{isol}	AC sinus 50 Hz, 1 min	2500	V

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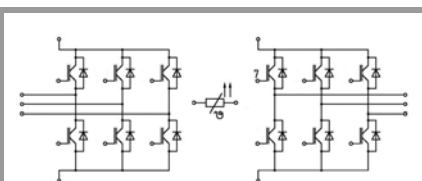
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ACC

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1 - 6						
$V_{CE(sat)}$	$I_C = 8\text{ A}$ $V_{GE} = 15\text{ V}$ 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	$T_j = 25^\circ\text{C}$		131	150	m Ω
		$T_j = 150^\circ\text{C}$		194	206	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}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		0.49		nF
C_{oes}		$f = 1\text{ MHz}$		0.05		nF
C_{res}		$f = 1\text{ MHz}$		0.03		nF
Q_G	$V_{GE} = -8\text{ V...}+15\text{ V}$			45		nC
R_{Gint}	$T_j = 25^\circ\text{C}$			0.0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 8\text{ A}$	$T_j = 125^\circ\text{C}$		117		ns
t_r	$R_{G\ on} = 51\ \Omega$ $R_{G\ off} = 51\ \Omega$	$T_j = 125^\circ\text{C}$		70		ns
E_{on}		$T_j = 125^\circ\text{C}$		1		mJ
$t_{d(off)}$	$di/dt_{on} = 97\text{ A}/\mu\text{s}$	$T_j = 125^\circ\text{C}$		300		ns
t_f	$di/dt_{off} = 106\text{ A}/\mu\text{s}$ $du/dt = 3300\text{ V}/\mu\text{s}$	$T_j = 125^\circ\text{C}$		120		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$ $L_s = 22\text{ nH}$	$T_j = 125^\circ\text{C}$		0.7		mJ
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			1.84		K/W
$R_{th(j-s)}$	per IGBT, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			1.6		K/W
IGBT 7 - 12						
$V_{CE(sat)}$	$I_C = 15\text{ A}$ $V_{GE} = 15\text{ V}$ 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	$V_{GE} = -8\text{ V...}+15\text{ V}$			85		nC
R_{Gint}	$T_j = 25^\circ\text{C}$			0		Ω
$t_{d(on)}$	$V_{CC} = 600\text{ V}$ $I_C = 15\text{ A}$	$T_j = 150^\circ\text{C}$		92		ns
t_r	$R_{G\ on} = 39\ \Omega$ $R_{G\ off} = 39\ \Omega$	$T_j = 150^\circ\text{C}$		74		ns
E_{on}		$T_j = 150^\circ\text{C}$		2.1		mJ
$t_{d(off)}$	$di/dt_{on} = 188\text{ A}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		319		ns
t_f	$di/dt_{off} = 200\text{ A}/\mu\text{s}$ $du/dt = 3500\text{ V}/\mu\text{s}$	$T_j = 150^\circ\text{C}$		77		ns
E_{off}	$V_{GE} = +15/-15\text{ V}$ $L_s = 22\text{ nH}$	$T_j = 150^\circ\text{C}$		1.6		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

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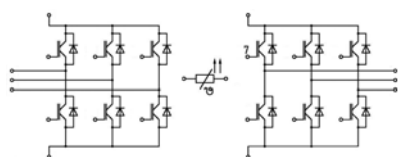
Typical Applications*

- 4Q inverters

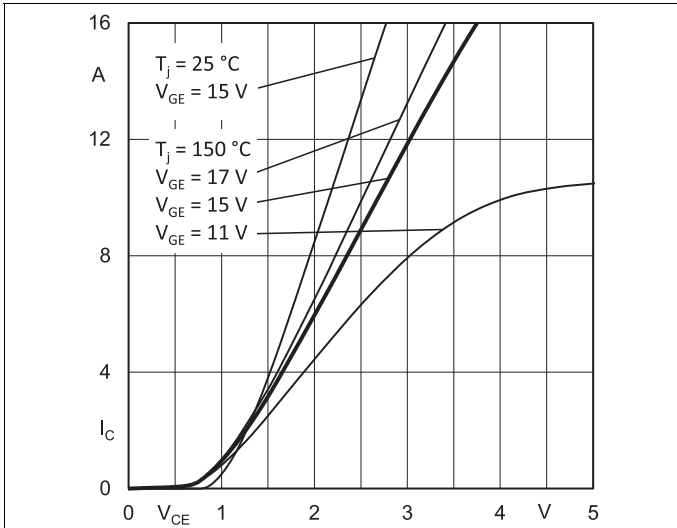
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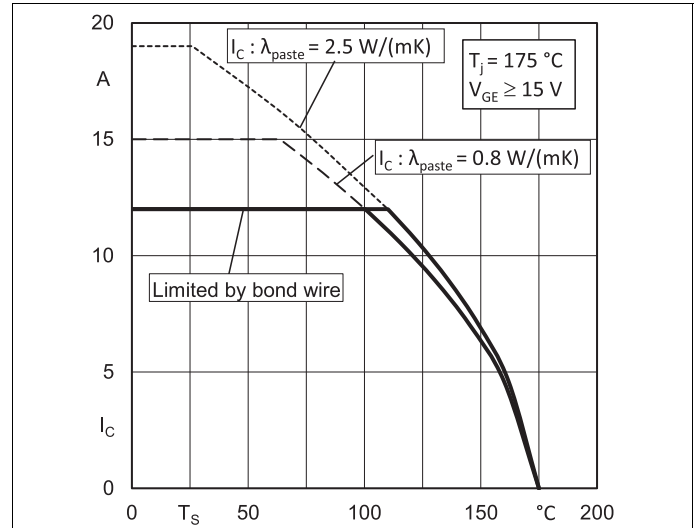
Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Diode 1 - 6						
$V_F = V_{EC}$	$I_F = 8\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25^\circ\text{C}$		1.96	2.22	V
		$T_j = 125^\circ\text{C}$		2.08	2.34	V
V_{F0}	chipelevel	$T_j = 25^\circ\text{C}$		1.00	1.10	V
		$T_j = 125^\circ\text{C}$		0.80	0.90	V
r_F	chipelevel	$T_j = 25^\circ\text{C}$		120	140	m Ω
		$T_j = 125^\circ\text{C}$		160	180	m Ω
I_{RRM}	$I_F = 8\text{ A}$	$T_j = 125^\circ\text{C}$		5.4		A
Q_{rr}	$di/dt_{off} = 93\text{ A}/\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 125^\circ\text{C}$		1.9		μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 125^\circ\text{C}$		0.8		mJ
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=0.8\text{ W}/(\text{mK})$			2.5		K/W
$R_{th(j-s)}$	per Diode, $\lambda_{paste}=2.5\text{ W}/(\text{mK})$			2.2		K/W
Diode 7 - 12						
$V_F = V_{EC}$	$I_F = 15\text{ A}$ $V_{GE} = 0\text{ V}$ 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}	$I_F = 15\text{ A}$	$T_j = 150^\circ\text{C}$		8.9		A
Q_{rr}	$di/dt_{off} = 220\text{ A}/\mu\text{s}$ $V_{GE} = -15\text{ V}$	$T_j = 150^\circ\text{C}$		2.2		μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150^\circ\text{C}$		0.8		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
Module						
L_{CE}				60		nH
M_s	to heat sink		2		2.5	Nm
w				30		g
Temperature Sensor						
R_{100}	$T_r=100^\circ\text{C}$ ($R_{25}=1000\Omega$)			$1670 \pm 3\%$		Ω
$R(T)$	$R(T)=1000\Omega[1+A(T-25^\circ\text{C})+B(T-25^\circ\text{C})^2]$ $A = 7.635 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$, $B = 1.731 \cdot 10^{-5} \text{ }^\circ\text{C}^{-2}$					



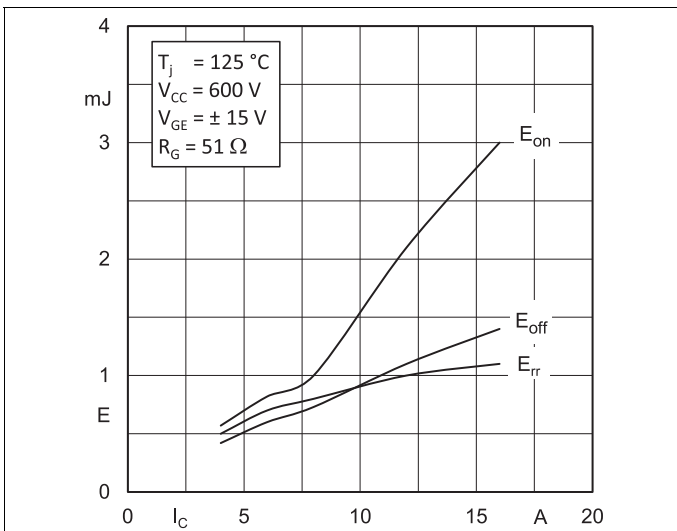
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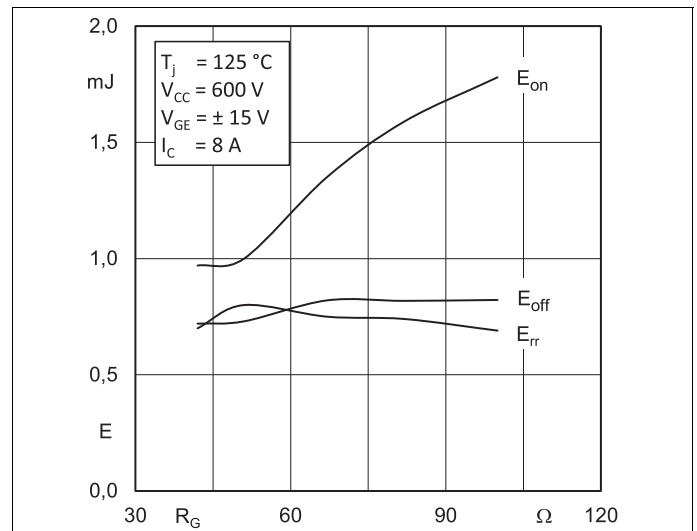
IGBT 1-6 - Fig. 1:
Typ. output characteristic



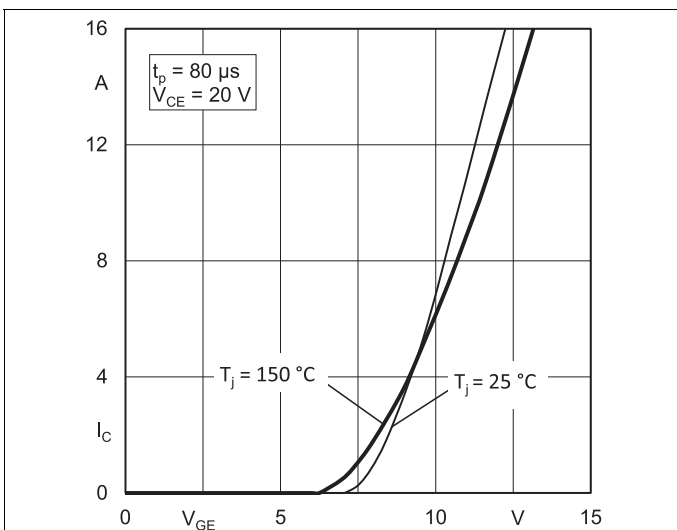
IGBT 1-6 - Fig. 2:
Typ. rated current vs. temperature $I_C = f(T_s)$



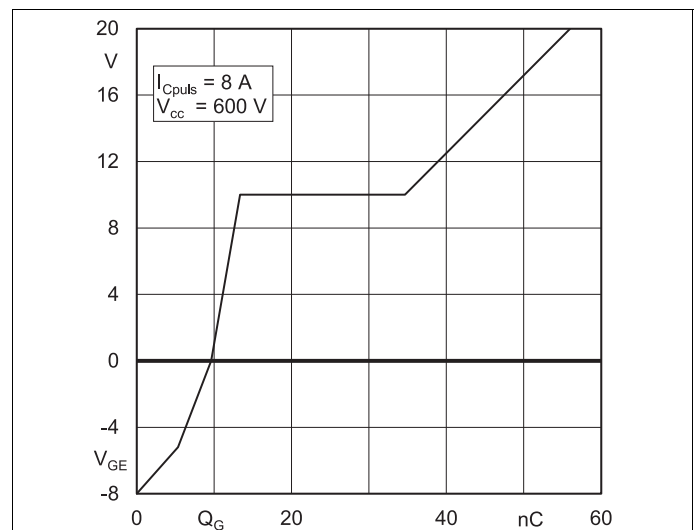
IGBT 1-6 - Fig. 3:
Typ. turn-on /-off energy = $f(I_C)$



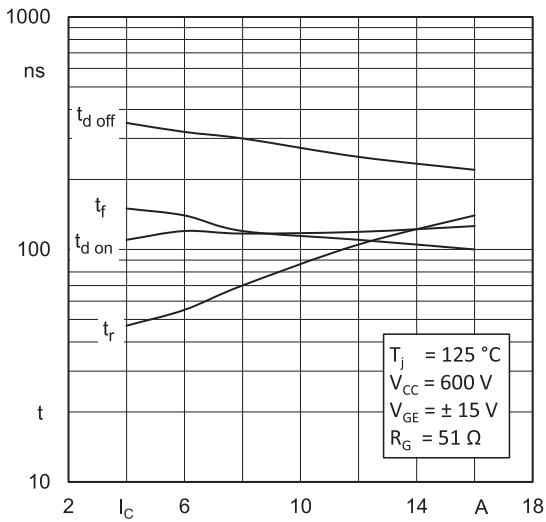
IGBT 1-6 - Fig. 4:
Typ. turn-on /-off energy = $f(R_G)$



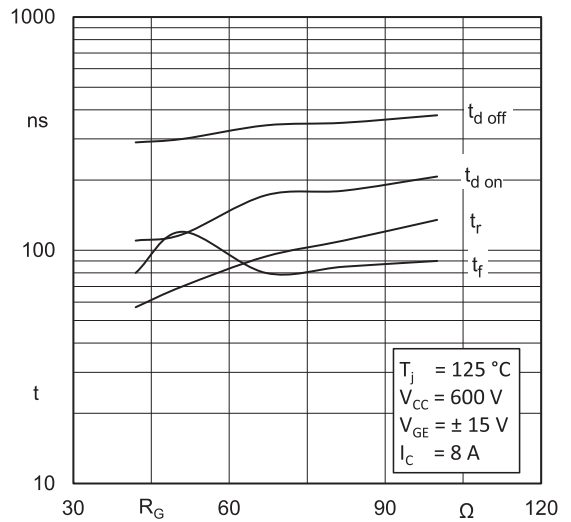
IGBT 1-6 - Fig. 5:
Typ. transfer characteristic



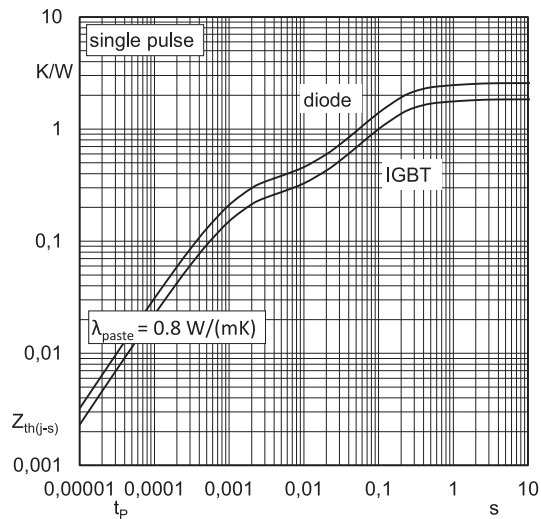
IGBT 1-6 - Fig. 6:
Typ. gate charge characteristic



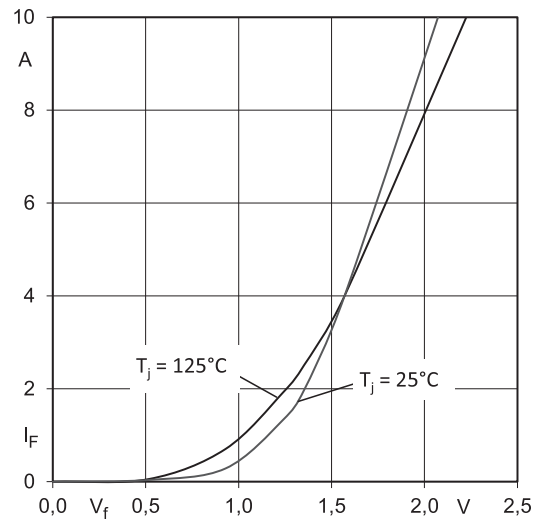
IGBT 1-6 - Fig. 7:
Typ. switching times vs. I_C



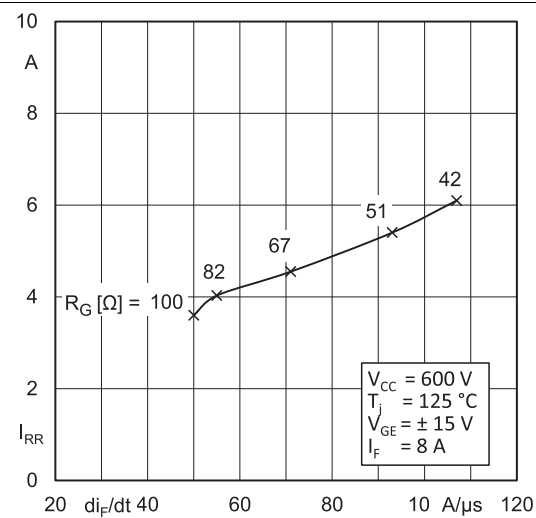
IGBT 1-6 - Fig. 8:
Typ. switching times vs. gate resistor R_G



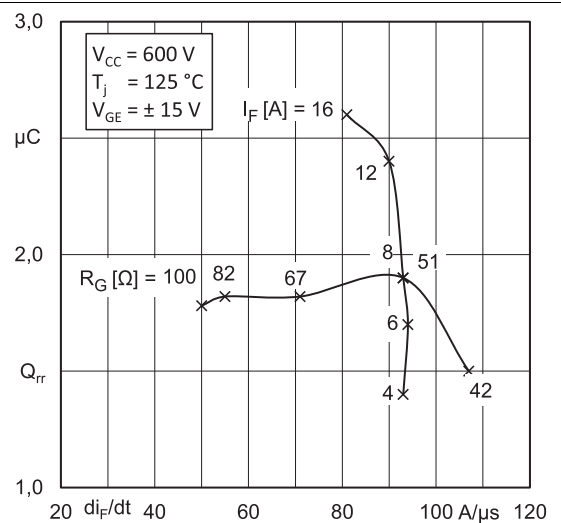
IGBT 1-6 - Fig. 9:
Transient thermal impedance of IGBT and Diode



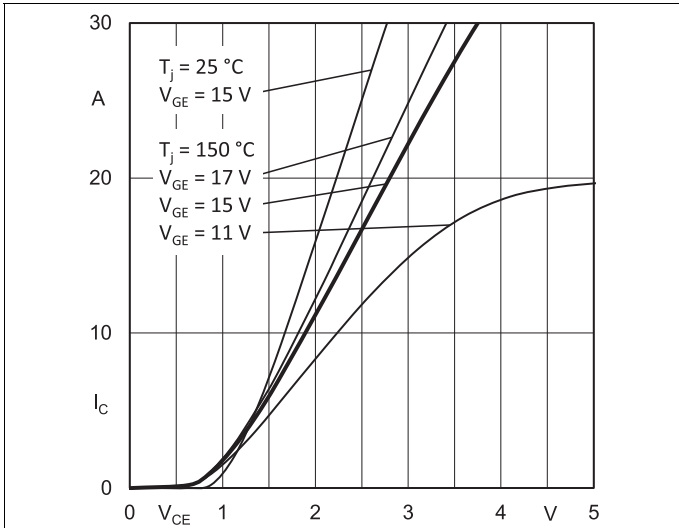
IGBT 1-6 - Fig. 10:
CAL diode forward characteristic



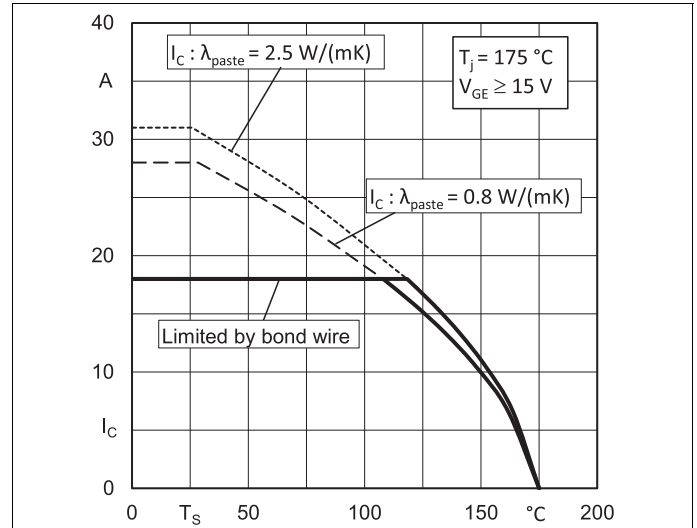
IGBT 1-6 - Fig. 11:
Typ. CAL diode peak reverse recovery current



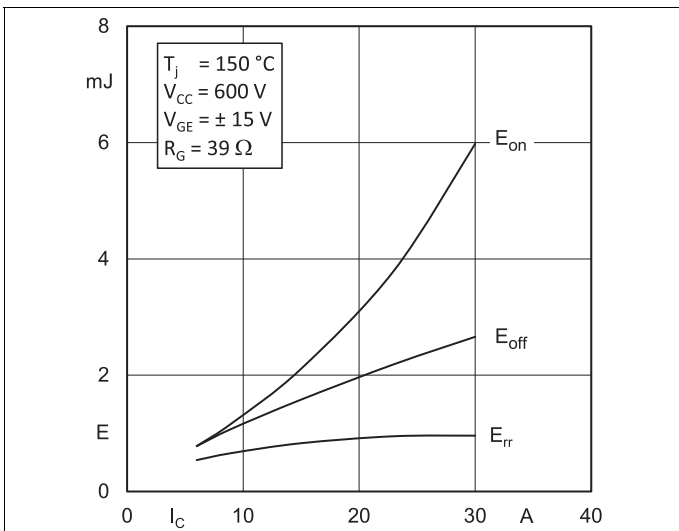
IGBT 1-6 - Fig. 12:
Typ. CAL diode recovery charge



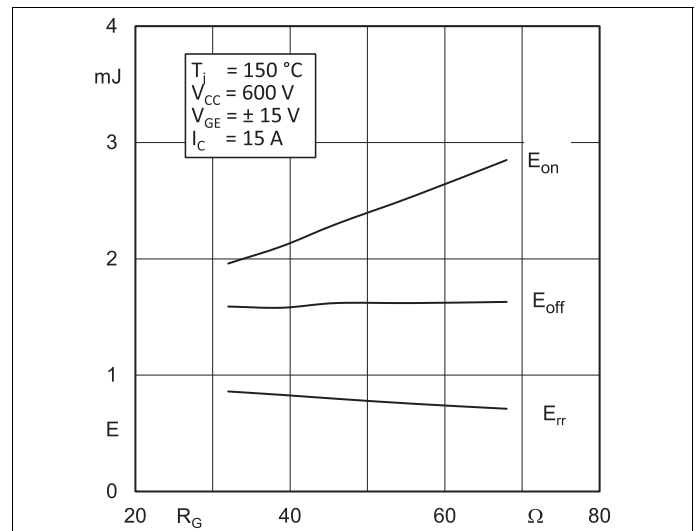
IGBT 7-12 - Fig. 1:
Typ. output characteristic



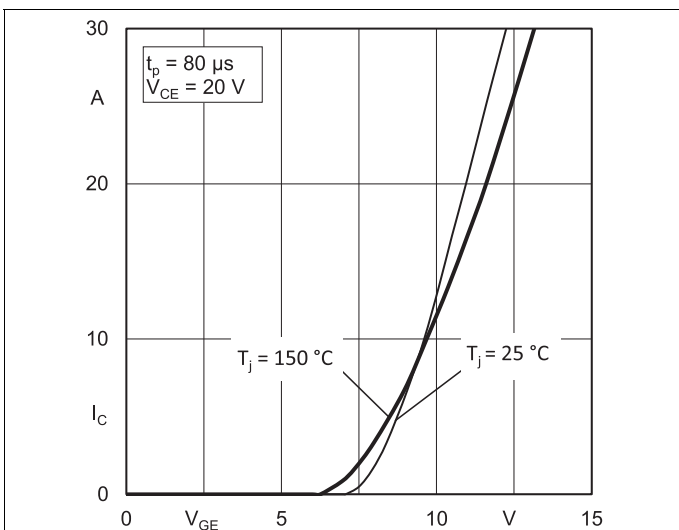
IGBT 7-12 - Fig. 2:
Typ. rated current vs. temperature $I_C = f(T_S)$



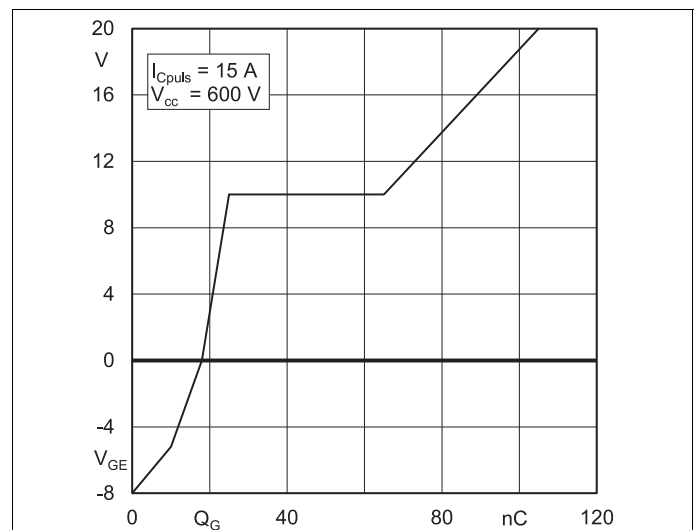
IGBT 7-12 - Fig. 3:
Typ. turn-on /-off energy = $f(I_C)$



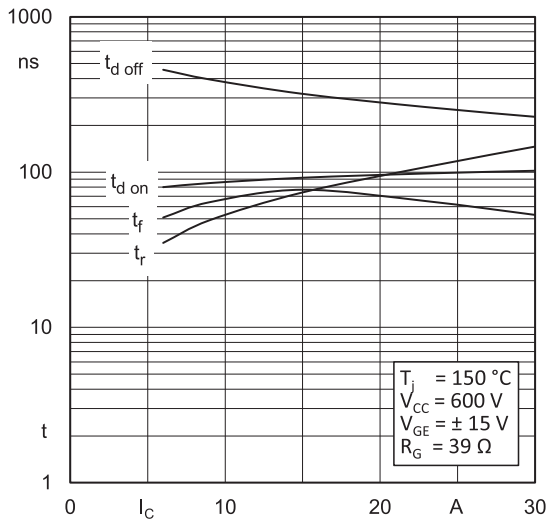
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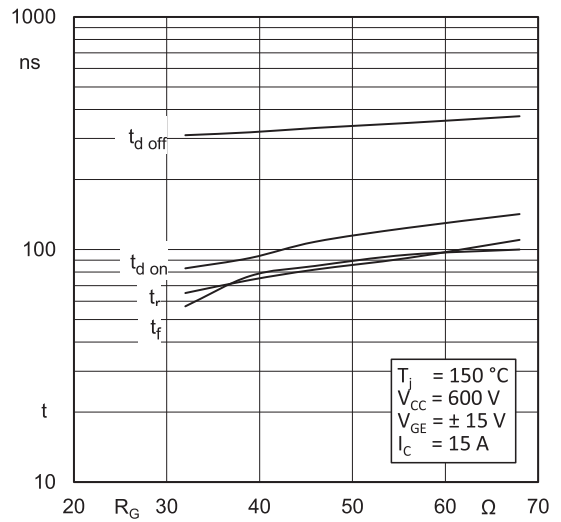
IGBT 7-12 - Fig. 5:
Typ. transfer characteristic



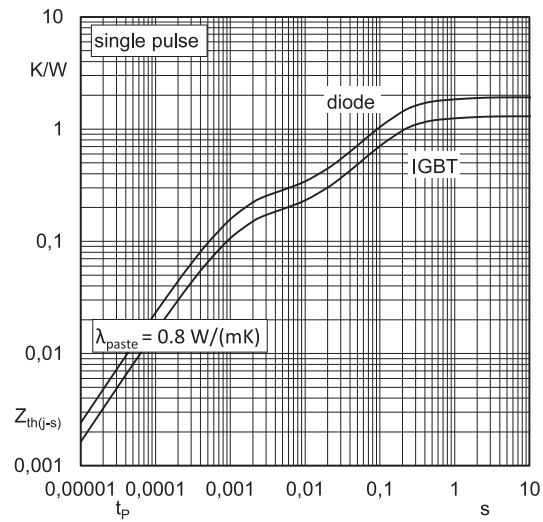
IGBT 7-12 - Fig. 6:
Typ. gate charge characteristic



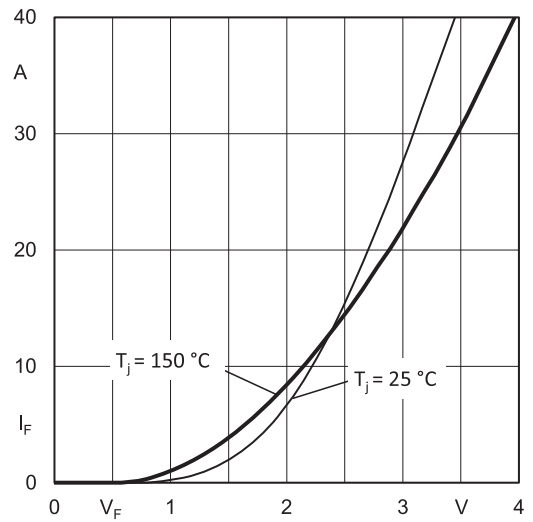
IGBT 7-12 - Fig. 7:
Typ. switching times vs. I_C



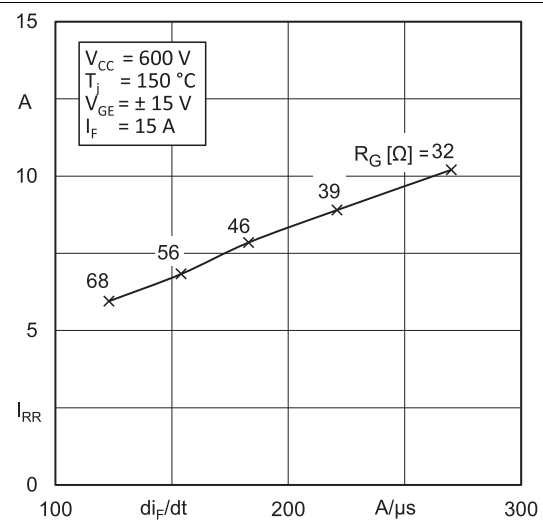
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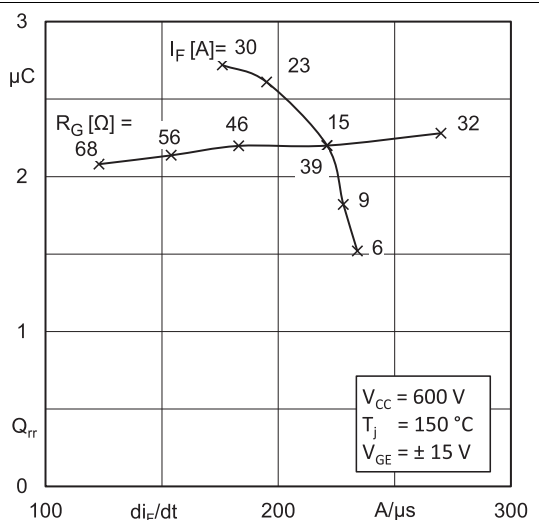
IGBT 7-12 - Fig. 9:
Transient thermal impedance of IGBT and Diode



IGBT 7-12 - Fig. 10:
CAL diode forward characteristic

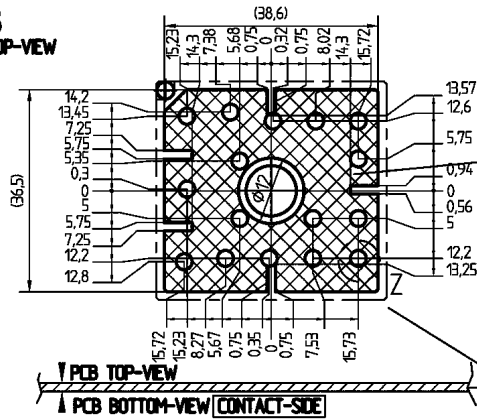


IGBT 7-12 - Fig. 11:
Typ. CAL diode peak reverse recovery current

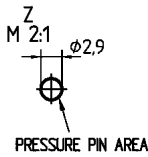


IGBT 7-12 - Fig. 12:
Typ. CAL diode recovery charge

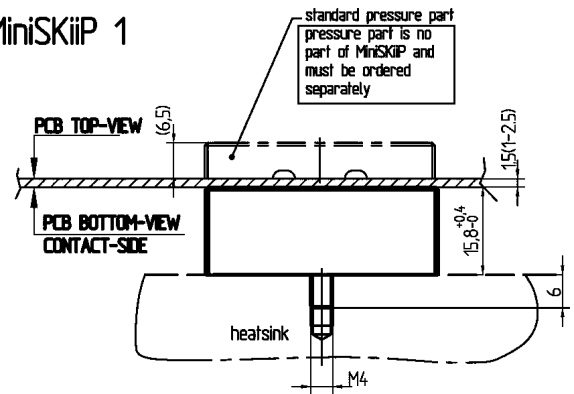
PCB PCB TOP-VIEW



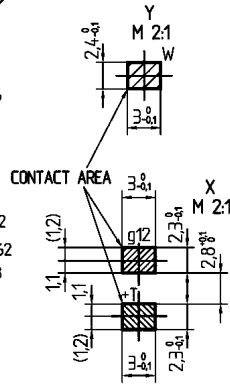
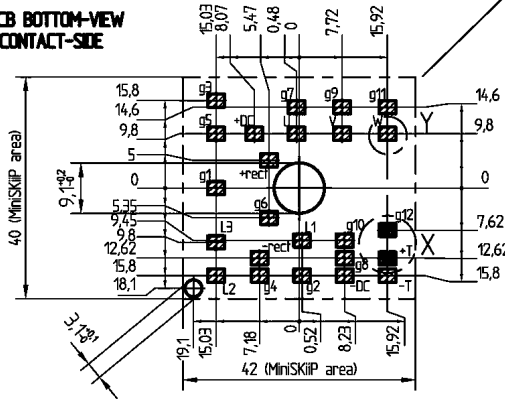
Only for the standard pressure part:
Accessible for mounting of SMD (max height 3.5) on PCB by customer



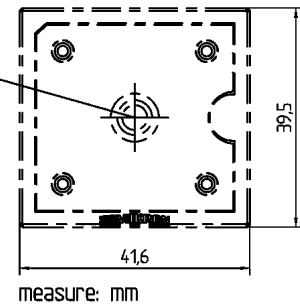
MiniSKiiP 1



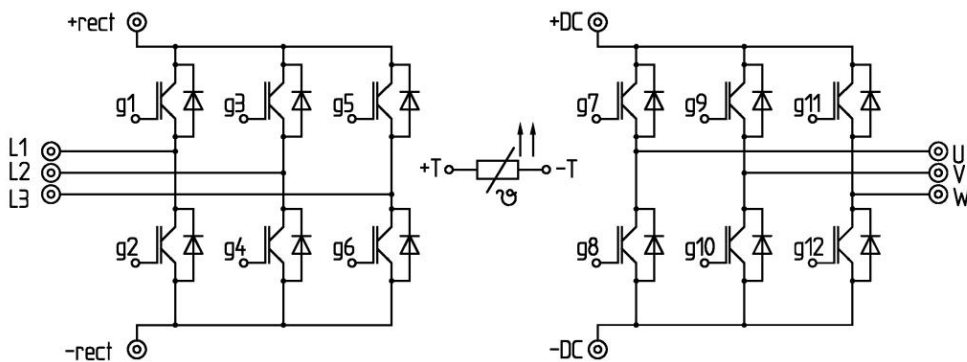
PCB BOTTOM-VIEW CONTACT-SIDE



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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