MiniSKiiP® 2

Twin 6-pack

SKiiP 24ACC12T4V10

Features*

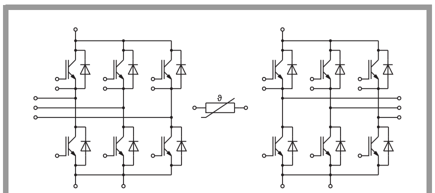
- Trench 4 IGBTs
- Robust and soft switching freewheeling diodes in CAL technology
- Highly reliable spring contacts for electrical connections
- UL recognized: File no. E63532

Typical Applications

- 4Q inverters

Remarks

- Max. case temperature limited to T_C=125°C
- Product reliability results valid for T_j≤150°C (recommended $T_{j,op}$=-40...+150°C)
- Terminal distances sufficient for basic insulation in 3-phase 480VAC TN systems
- DC-link voltage V_{DC}≤800V
- 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



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Absolute Maximum Ratings

Symbol	Conditions		Values	Unit
IGBT 1 - 6				
V_{CES}	T_j = 25 °C		1200	V
I_C	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	41	A
	T_j = 175 °C	T_s = 70 °C	34	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	45	A
	T_j = 175 °C	T_s = 70 °C	37	A
I_{Cnom}			25	A
I_{CRM}			75	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
IGBT 7 - 12				
V_{CES}	T_j = 25 °C		1200	V
I_C	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	52	A
	T_j = 175 °C	T_s = 70 °C	43	A
I_C	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	58	A
	T_j = 175 °C	T_s = 70 °C	48	A
I_{Cnom}			35	A
I_{CRM}			105	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
Diode 1 - 6				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	32	A
	T_j = 175 °C	T_s = 70 °C	26	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	35	A
	T_j = 175 °C	T_s = 70 °C	28	A
I_{FRM}			50	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		100	A
T_j			-40 ... 175	°C
Diode 7 - 12				
V_{RRM}	T_j = 25 °C		1200	V
I_F	λ_{paste}=0.8 W/(mK)	T_s = 25 °C	44	A
	T_j = 175 °C	T_s = 70 °C	35	A
I_F	λ_{paste}=2.5 W/(mK)	T_s = 25 °C	49	A
	T_j = 175 °C	T_s = 70 °C	40	A
I_{FRM}			70	A
I_{FSM}	10 ms, sin 180°, T_j = 150 °C		170	A
T_j			-40 ... 175	°C
Module				
$I_{t(RMS)}$	20 A per spring		40	A
T_{stg}	module without TIM		-40 ... 125	°C
V_{isol}	AC sinus 50 Hz, 1 min		2500	V

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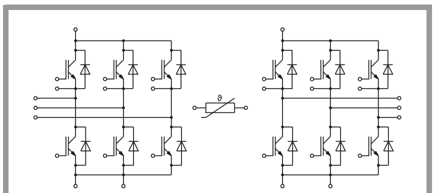

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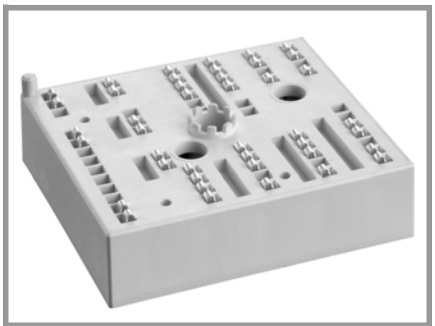
Characteristics

Symbol	Conditions		min.	typ.	max.	Unit
IGBT 1 - 6						
$V_{CE(sat)}$	I_C = 25 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.25	2.45	V
V_{CE0}	chiplevel	T_j = 25 °C		0.80	0.90	V
		T_j = 150 °C		0.70	0.80	V
r_{CE}	V_{GE} = 15 V, chiplevel	T_j = 25 °C		42	48	mΩ
		T_j = 150 °C		62	66	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE} V, I_C = 1 mA		5.3	5.8	6.3	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	T_j = 25 °C			1	mA
						mA
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V	f = 1 MHz		1.45		nF
C_{oes}		f = 1 MHz		0.12		nF
C_{res}		f = 1 MHz		0.05		nF
Q_G	V_{GE} = - 8 V...+ 15 V			142		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 25 A, $R_{G\,on}$ = 39 Ω, $R_{G\,off}$ = 39 Ω, di/dt$_{on}$ = 250 A/µs, di/dt$_{off}$ = 400 A/µs, dv/dt = 3600 V/µs, V_{GE} = +15/-15 V, L_s = 22 nH	T_j = 150 °C		96		ns
t_r		T_j = 150 °C		80		ns
E_{on}		T_j = 150 °C		4.2		mJ
$t_{d(off)}$		T_j = 150 °C		400		ns
t_f		T_j = 150 °C		51		ns
E_{off}		T_j = 150 °C		2.6		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			1		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.84		K/W
IGBT 7 - 12						
$V_{CE(sat)}$	I_C = 35 A, V_{GE} = 15 V, chiplevel	T_j = 25 °C		1.85	2.10	V
		T_j = 150 °C		2.25	2.45	V
V_{CE0}	chiplevel	T_j = 25 °C		0.80	0.90	V
		T_j = 150 °C		0.70	0.80	V
r_{CE}	V_{GE} = 15 V, chiplevel	T_j = 25 °C		30	34	mΩ
		T_j = 150 °C		44	47	mΩ
$V_{GE(th)}$	V_{GE} = V_{CE} V, I_C = 1 mA		5	5.8	6.5	V
I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	T_j = 25 °C			1	mA
				-		mA
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V	f = 1 MHz		1.95		nF
C_{oes}		f = 1 MHz		0.16		nF
C_{res}		f = 1 MHz		0.12		nF
Q_G	V_{GE} = - 8 V...+ 15 V			200		nC
R_{Gint}	T_j = 25 °C			0		Ω
$t_{d(on)}$	V_{CC} = 600 V, I_C = 35 A, $R_{G\,on}$ = 16 Ω, $R_{G\,off}$ = 16 Ω, di/dt$_{on}$ = 680 A/µs, di/dt$_{off}$ = 560 A/µs, dv/dt = 4000 V/µs, V_{GE} = +15/-15 V, L_s = 22 nH	T_j = 150 °C		52		ns
t_r		T_j = 150 °C		34		ns
E_{on}		T_j = 150 °C		3.9		mJ
$t_{d(off)}$		T_j = 150 °C		337		ns
t_f		T_j = 150 °C		53		ns
E_{off}		T_j = 150 °C		3.5		mJ
$R_{th(j-s)}$	per IGBT, λ_{paste}=0.8 W/(mK)			0.85		K/W
$R_{th(j-s)}$	per IGBT, λ_{paste}=2.5 W/(mK)			0.7		K/W



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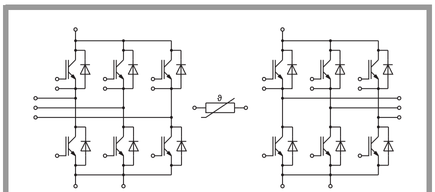

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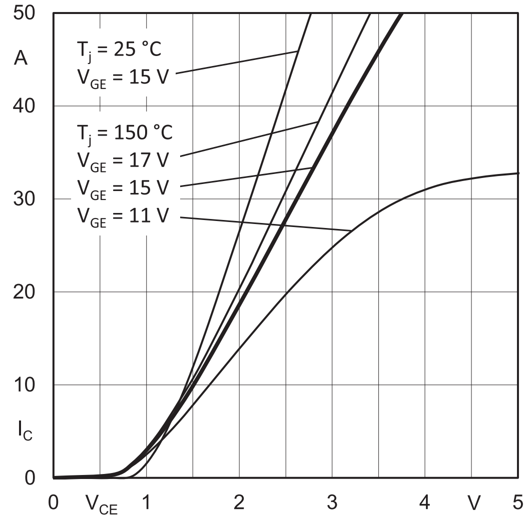
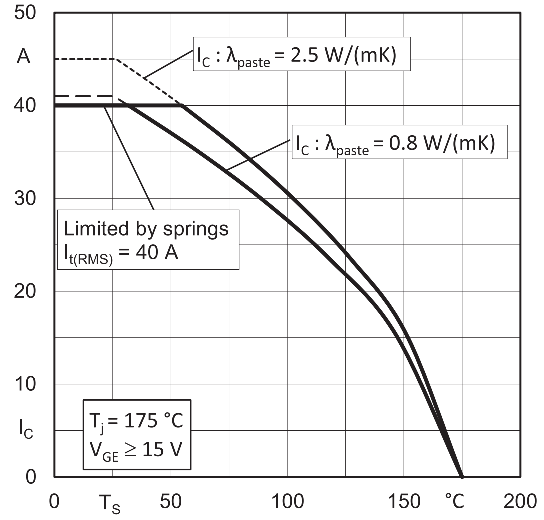
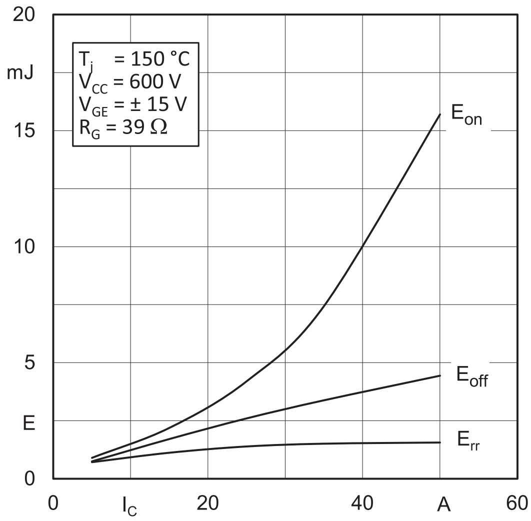
Characteristics						
Symbol	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
Diode 1 - 6						
$V_F = V_{EC}$	I_F = 25 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.41	2.74	V
		T_j = 150 °C		2.45	2.79	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		44	50	mΩ
		T_j = 150 °C		62	68	mΩ
I_{RRM}	I_F = 25 A di/dt_{off} = 380 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		17		A
Q_{rr}		T_j = 150 °C		4		µC
E_{rr}		T_j = 150 °C		1.4		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.52		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			1.31		K/W
Diode 7 - 12						
$V_F = V_{EC}$	I_F = 35 A V_{GE} = 0 V chiplevel	T_j = 25 °C		2.30	2.62	V
		T_j = 150 °C		2.29	2.62	V
V_{F0}	chiplevel	T_j = 25 °C		1.30	1.50	V
		T_j = 150 °C		0.90	1.10	V
r_F	chiplevel	T_j = 25 °C		29	32	mΩ
		T_j = 150 °C		40	43	mΩ
I_{RRM}	I_F = 35 A di/dt_{off} = 720 A/µs V_{GE} = -15 V V_{CC} = 600 V	T_j = 150 °C		28		A
Q_{rr}		T_j = 150 °C		5.8		µC
E_{rr}		T_j = 150 °C		2.3		mJ
$R_{th(j-s)}$	per Diode, λ_{paste}=0.8 W/(mK)			1.2		K/W
$R_{th(j-s)}$	per Diode, λ_{paste}=2.5 W/(mK)			1		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°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} °C^{-1}, B = 1.731*10^{-5}°C^{-2} °C^{-2}					



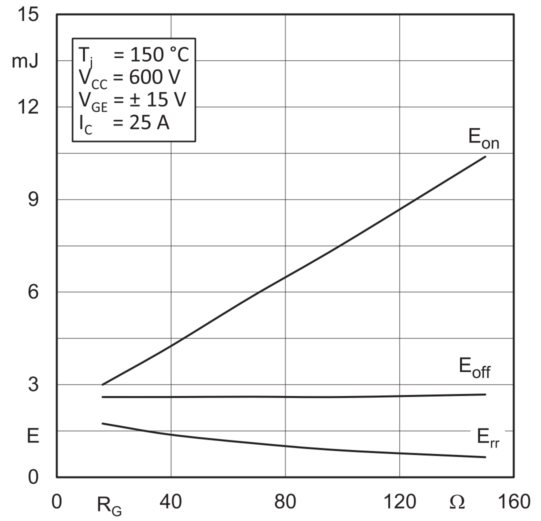
IGBT 1-6 - Fig. 1:
Typ. output characteristic



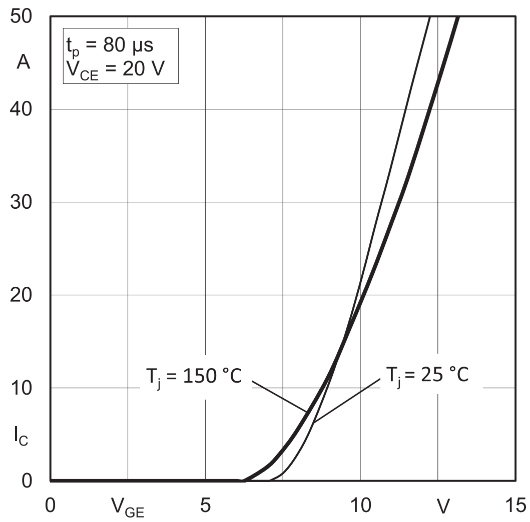
IGBT 1-6 - Fig. 2:
Typ. rated current vs. temperature $I_C = f(T_S)$



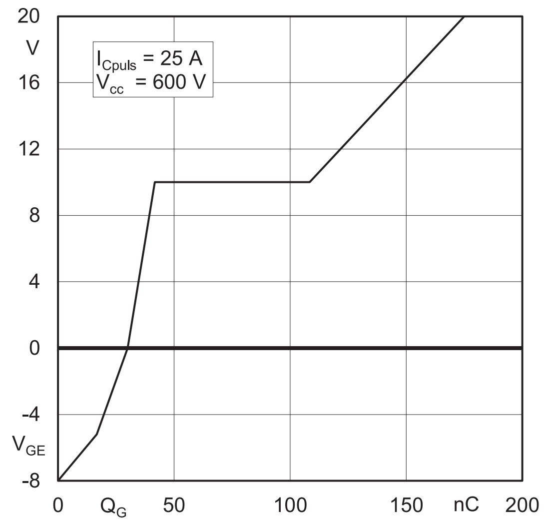
IGBT 1-6 - Fig. 3:
Typ. turn-on /-off energy = $f(I_C)$



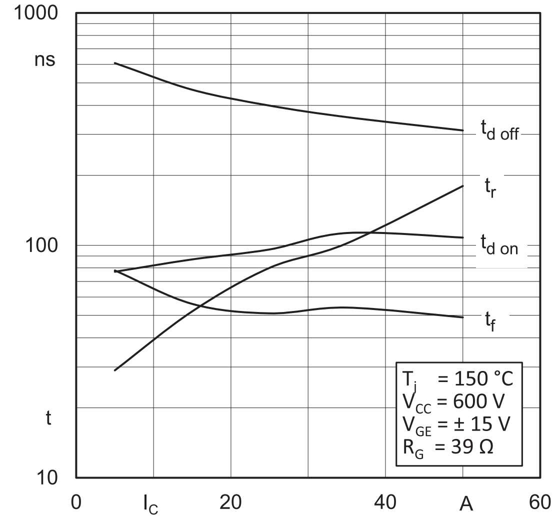
IGBT 1-6 - Fig. 4:
Typ. turn-on /-off energy = $f(R_G)$



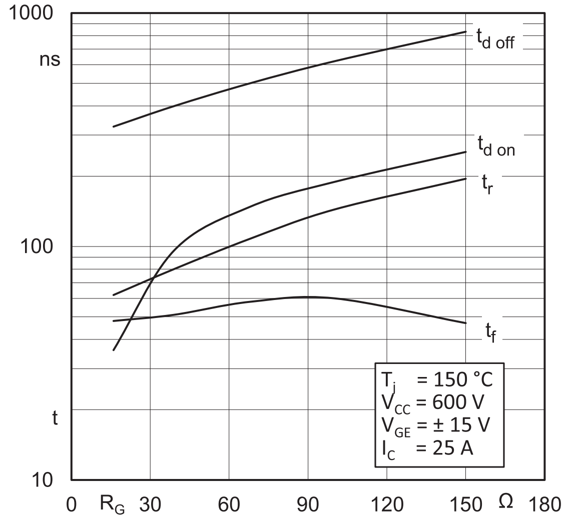
IGBT 1-6 - Fig. 5:
Typ. transfer characteristic



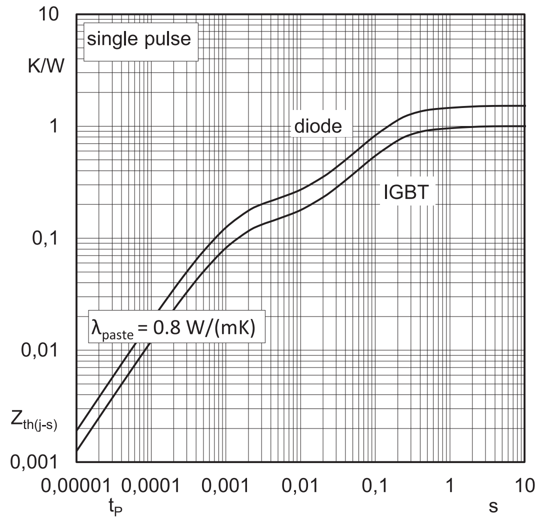
IGBT 1-6 - Fig. 6:
Typ. gate charge characteristic



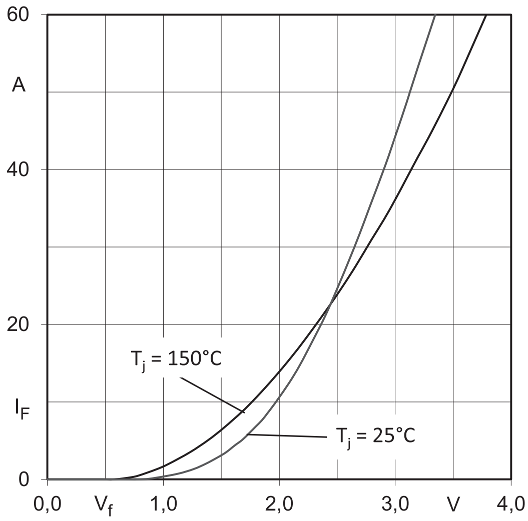
IGBT 1-6 - Fig. 7:
Typ. switching times vs. I_C



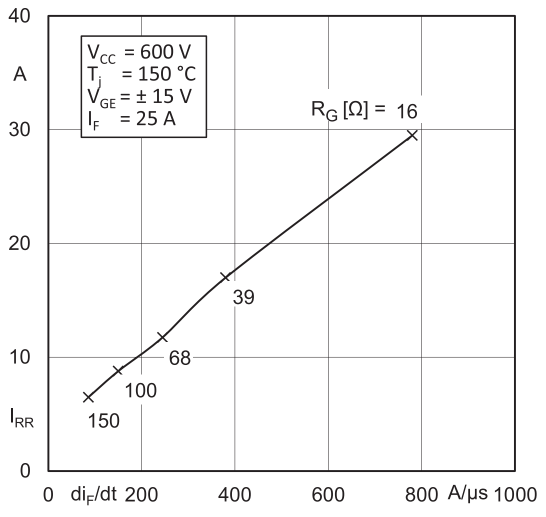
IGBT 1-6 - Fig. 8:
Typ. switching times vs. gate resistor R_G



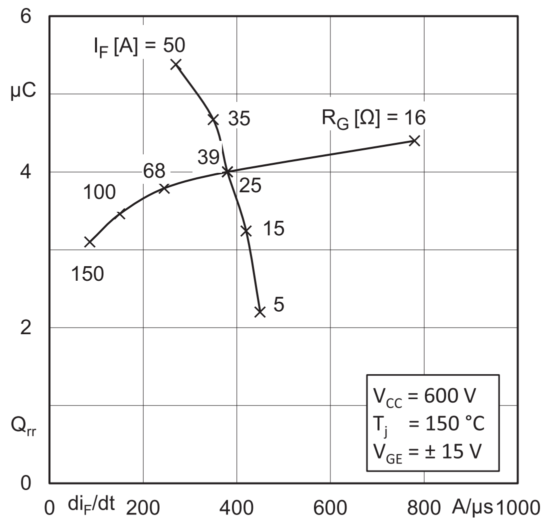
IGBT 1-6 - Fig. 9:
Transient thermal impedance of IGBT and Diode



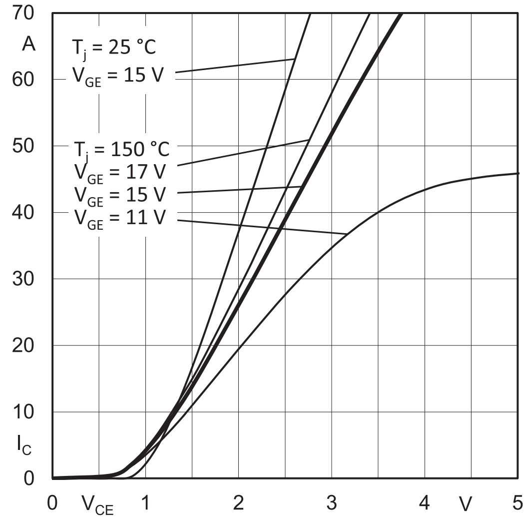
IGBT 1-6 - Fig. 10:
CAL diode forward characteristic



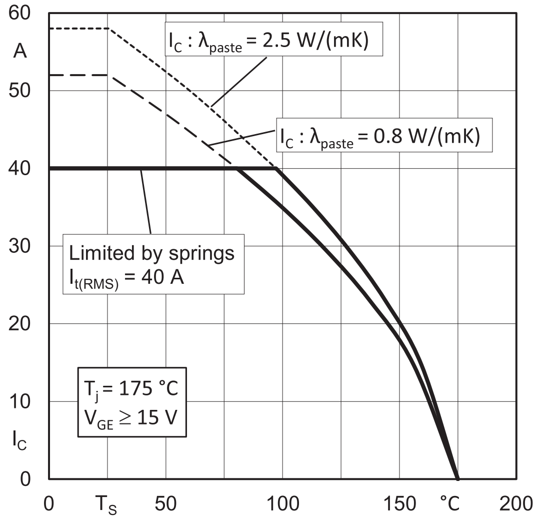
IGBT 1-6 - Fig. 11:
Typ. CAL diode peak reverse recovery current



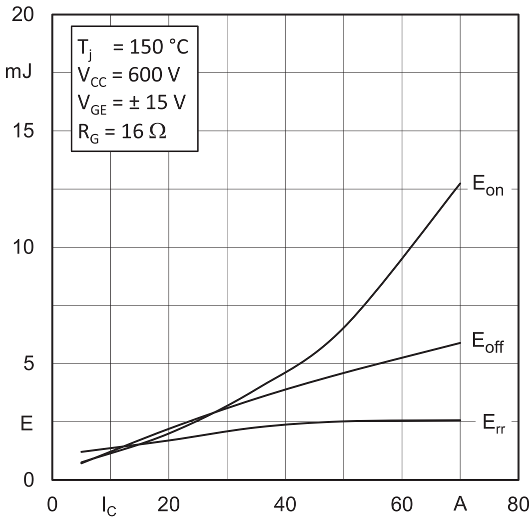
IGBT 1-6 - Fig. 12:
Typ. CAL diode recovery charge



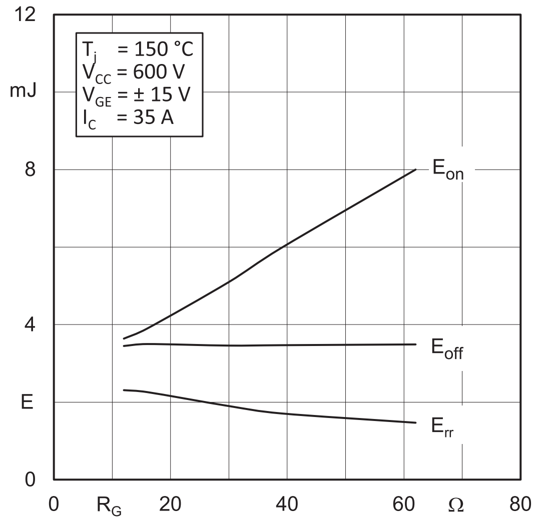
IGBT 7-12 - Fig. 1:
Typ. output characteristic



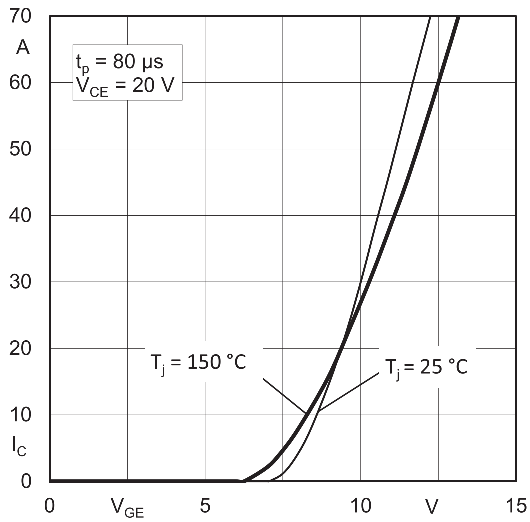
IGBT 7-12 - Fig. 2:
Typ. rated current vs. temperature $I_C = f(T_S)$



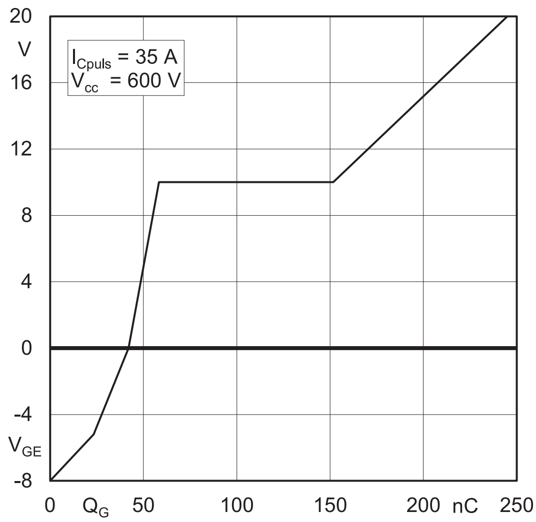
IGBT 7-12 - Fig. 3:
Typ. turn-on /-off energy = $f(I_C)$



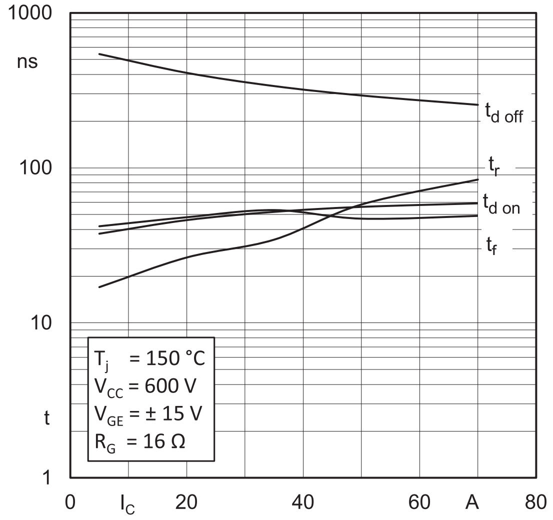
IGBT 7-12 - Fig. 4:
Typ. turn-on / -off energy = $f(R_G)$



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



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



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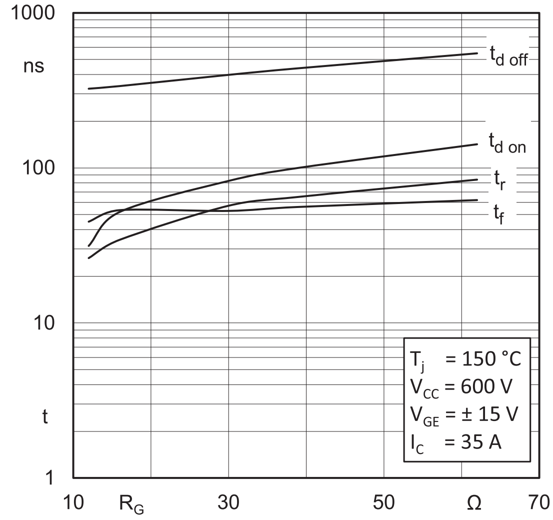

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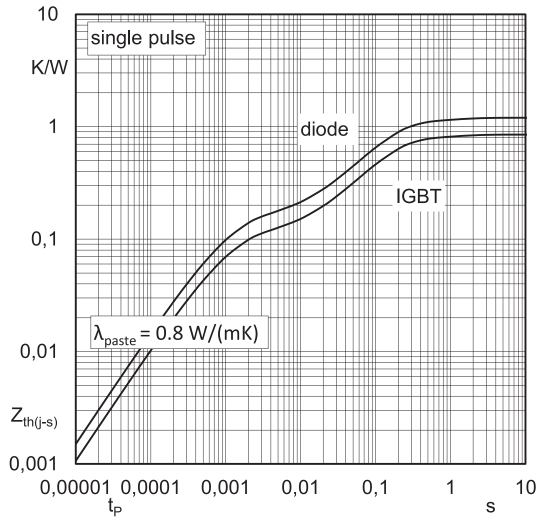

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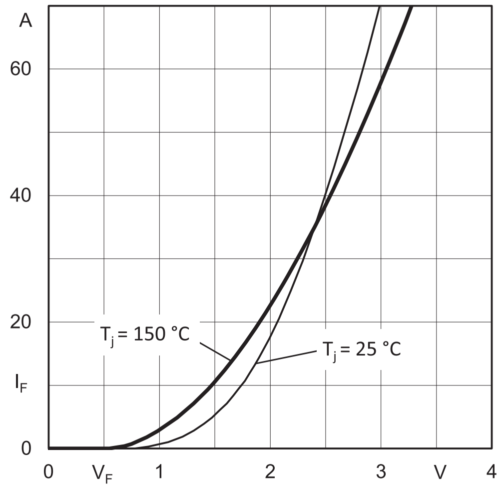

IGBT 7-12 - Fig. 10:
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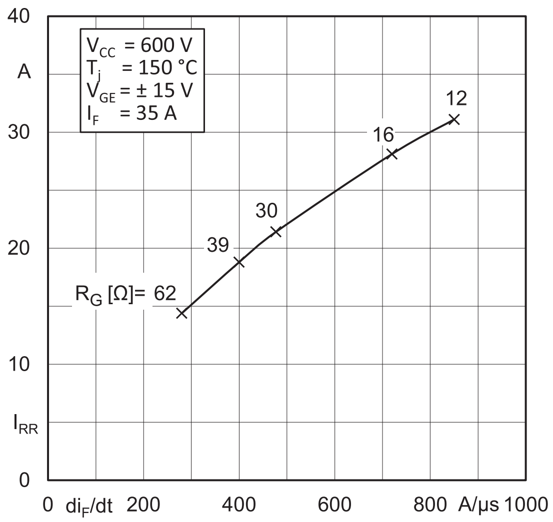

IGBT 7-12 - Fig. 11:
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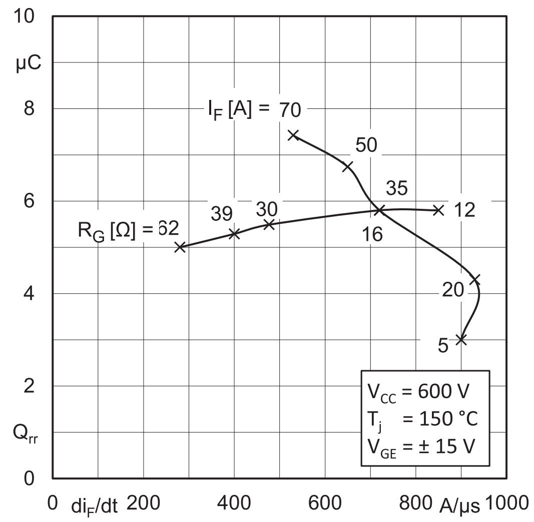
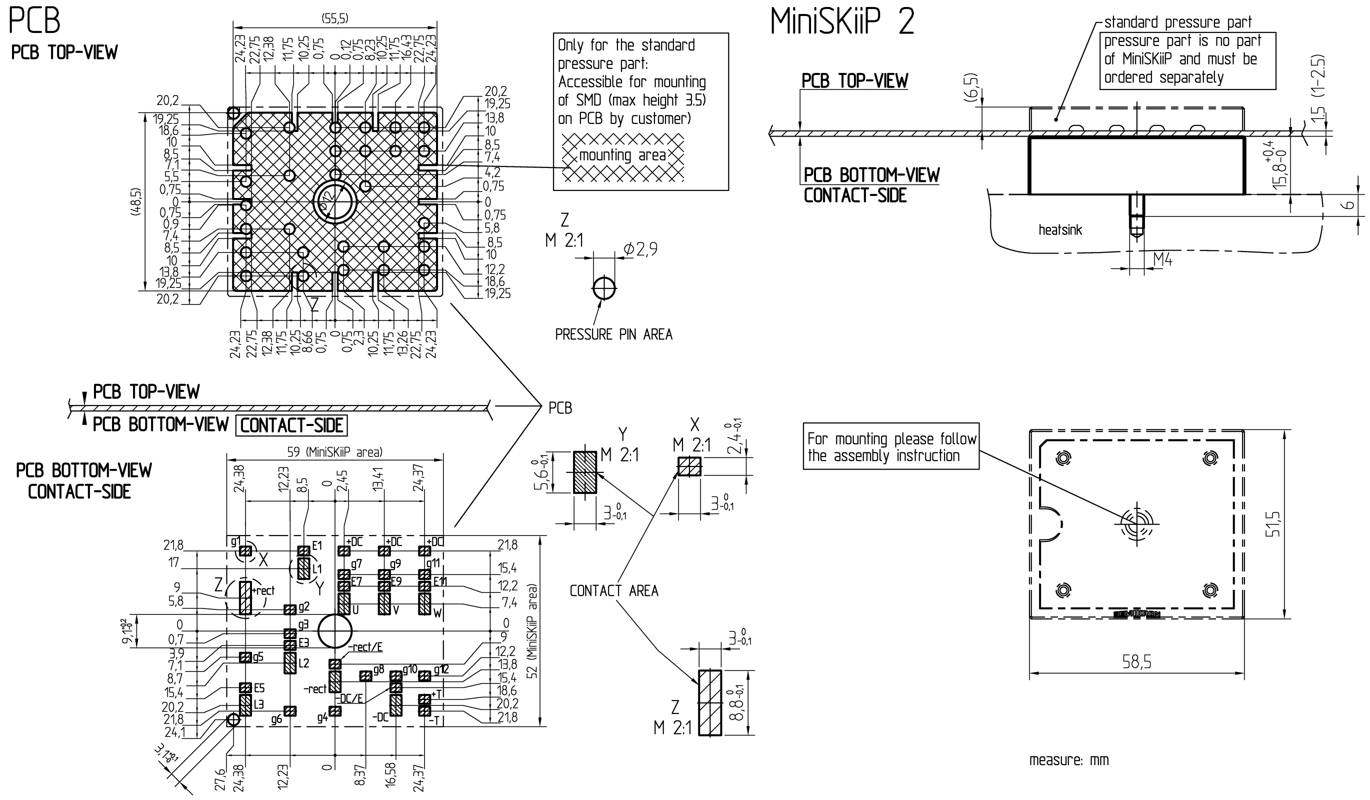
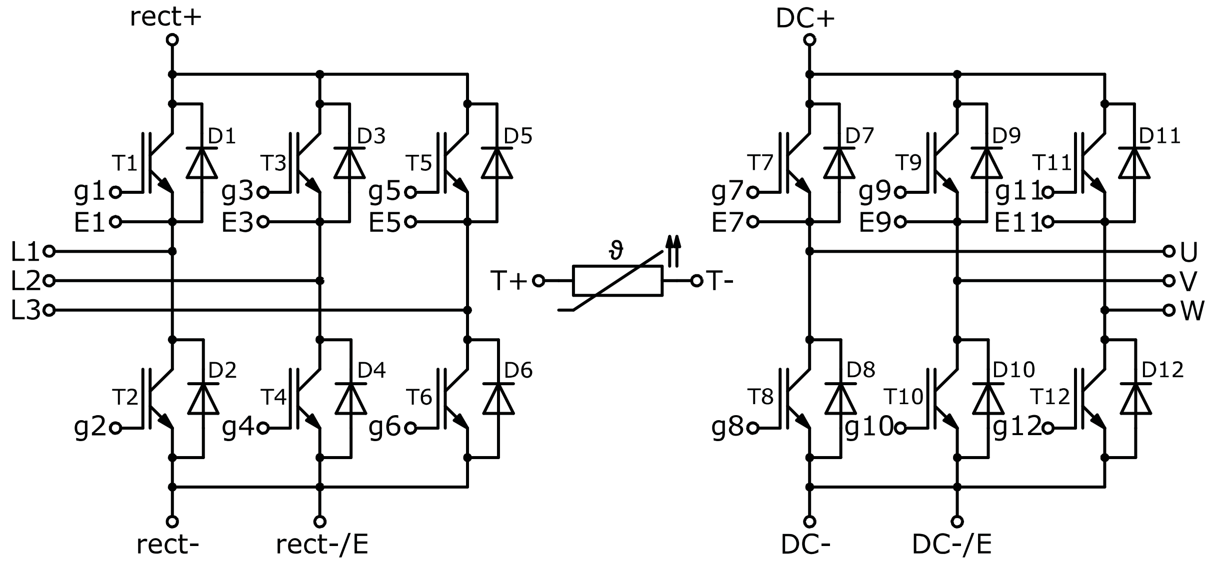


IGBT 7-12 - Fig. 12:
Typ. CAL diode recovery charge



Pinout and Dimensions



Pinout

This is an electrostatic discharge sensitive device (ESDS) due to international standard IEC 61340.

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