Vincotech

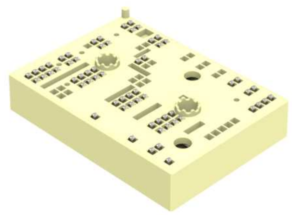
80-M3166BA140SC03-K489G42
datasheet

MiniSKiiP®CON 3 — **1600 V / 140 A**

Features

- Three-phase input rectifier with Brake
- Solderless interconnection
- Trench Fieldstop IGBT4 technology
- Si_3N_4 ceramic material

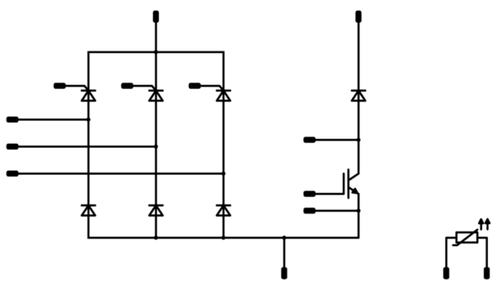
MiniSkiip®3 housing



Target applications

- Industrial drives
- UPS

Schematic



Types

- 80-M3166BA140SC03-K489G42

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Brake Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	190	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	450	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	559	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V	10 800	μs V
Maximum Junction Temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Brake Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	130	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms	T_j = 150 °C	900	A
Surge current capability	I^2t			4050	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	306	W
Maximum junction temperature	T_{jmax}			175	°C
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	151	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms	T_j = 150 °C	1380	A
Surge current capability	I^2t			9520	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	219	W
Maximum junction temperature	T_{jmax}			150	°C
Rectifier Thyristor					
Repetitive peak reverse voltage	V_{RRM}			1600	V
Forward average current	I_{FAV}	sine, d = 0,5 $T_j = T_{jmax}$	T_s = 80 °C	163	A
Surge forward current	I_{FSM}	t_p = 10 ms	T_j = 130 °C	1250	A
I²t value	I^2t			7810	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	286	W
Maximum Junction Temperature	T_{jmax}			130	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	5500	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm
Comparative Tracking Index	CTI			> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Brake Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0052	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 150	1,58	1,93 2,39	2,07	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			2	µA
Gate-emitter leakage current	I_{GES}		20	0		25			240	nA
Internal gate resistance	r_g							5		Ω
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		8600		pF
Reverse transfer capacitance	C_{res}							320		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease λ = 2,5 W/mK (Silicone-based)						0,17		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	15/0	700	149	25 125 150		64 65 66		ns
Rise time	t_r					25 125 150		71 71 70		
Turn-off delay time	$t_{d(off)}$					25 125 150		597 681 708		
Fall time	t_f					25 125 150		28 45 90		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 9,6 µC Q_{rFWD} = 19,7 µC Q_{rFWD} = 24,5 µC				25 125 150		26,612 35,580 38,379		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		11,669 16,842 18,783		

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Brake Diode										
Static										
Forward voltage	V_F				150	25 150		2,50 2,53	2,7	V
Reverse leakage current	I_R			1200		25 150			180 28000	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j\text{-}s)}$	Thermal grease λ = 2,5 W/mK (Silicone-based)						0,31		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 800 A/µs di/dt = 1170 A/µs di/dt = 1197 A/µs	15/0	700	149	25 125 150		41 54 61		A
Reverse recovery time	t_{rr}					25 125 150		461 625 713		ns
Recovered charge	Q_r					25 125 150		9,606 19,735 24,477		µC
Reverse recovered energy	E_{rec}					25 125 150		3,568 7,410 9,263		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		98 61 66		A/µs
Rectifier Diode										
Static										
Forward voltage	V_F				140	25 125		1,46 1,41		V
Reverse leakage current	I_R			1600		25 150			50 1100	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j\text{-}s)}$	Thermal grease λ = 2,5 W/mK (Silicone-based)						0,32		K/W

Characteristic Values

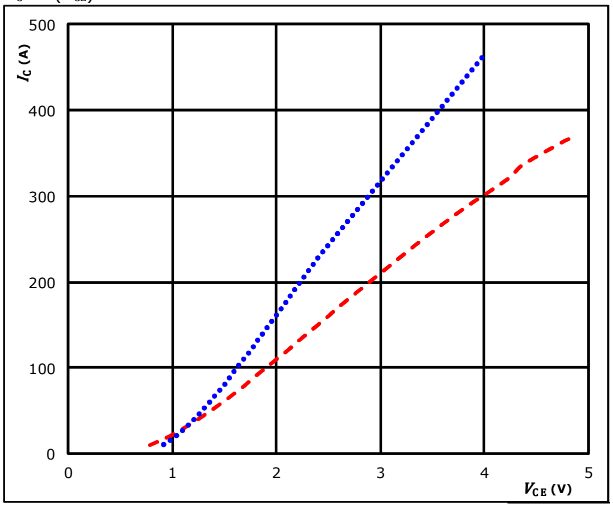
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Rectifier Thyristor										
Static										
Forward voltage	V_F				125	25 125		1,11 1,06	1,2	V
Threshold voltage (for power loss calc. only)	V_{to}					130			0,85	V
Slope resistance (for power loss calc. only)	r_t					130			3,2	mΩ
Critical rate of rise of off-state voltage	$(dv/dt)_{cr}$					130			1000	V/µs
Critical rate of rise of on-state current	$(di/dt)_{cr}$					130			100	A/µs
Circuit commutated turn-off time	t_q					130		150		µs
Holding current	I_H					25			220	mA
Latching current	I_L					25			550	mA
Gate trigger voltage	V_{GT}					25			1,98	V
Gate trigger current	I_{GT}					25			100	mA
Gate non-trigger voltage	V_{GD}					130	0,25			V
Gate non-trigger current	I_{GD}					115	6			mA
Thermal										
Thermal resistance chip to sink	$R_{th(j-s)}$	Thermal grease λ = 2,5 W/mK (Silicone-based)						0,27		K/W
Thermistor										
Rated resistance	R					25		1		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1670 Ω				100	-2		+2	%
R_{100}	R					100		1670		Ω
Power dissipation constant						25		0,76		mW/K
A-value	$A_{(25/50)}$					25		$7,635*10^{-3}$		1/K
B-value	$B_{(25/100)}$					25		$1,731*10^{-5}$		1/K²
Vincotech PTC Reference									E	

Brake Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

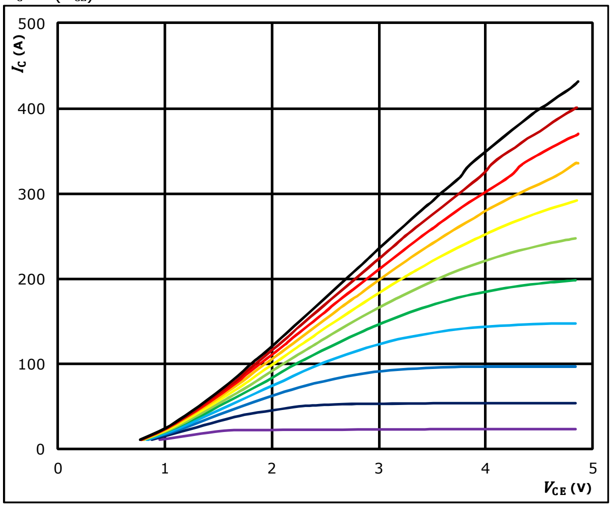


t_p =	250	µs		25 °C	
V_{GE} =	15	V	T_j:	150 °C	

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

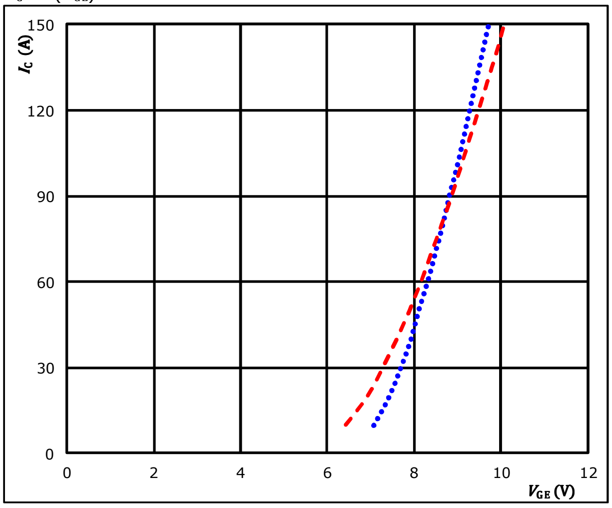


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

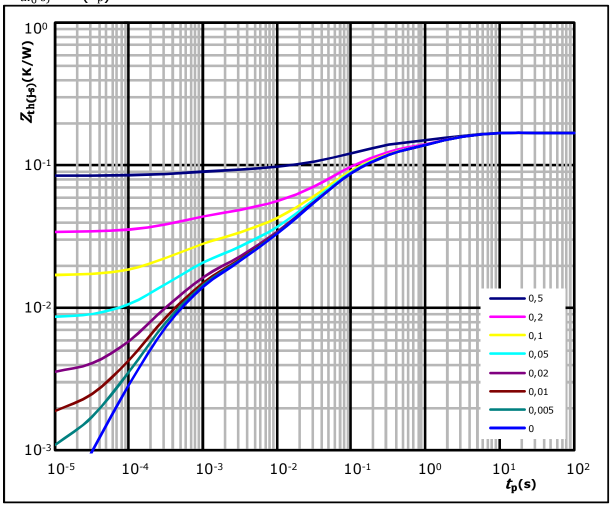


t_p =	100	µs		25 °C	
V_{CE} =	10	V	T_j:	150 °C	

figure 4. **IGBT**

Transient Thermal Impedance as function of Pulse duration

$Z_{th(j-s)} = f(t_p)$



D =	t_p / T	
$R_{th(j-s)}$ =	0,17	K/W

IGBT thermal model values

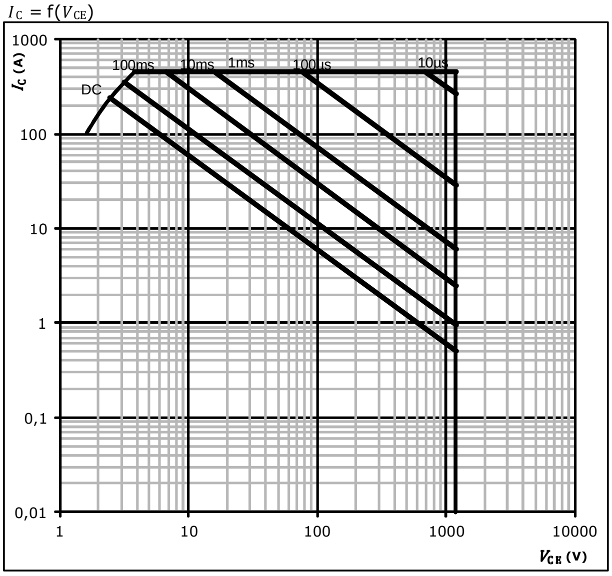
R (K/W)	τ (s)
4,70E-02	1,97E+00
2,42E-02	3,38E-01
6,55E-02	7,73E-02
1,51E-02	1,74E-02
7,58E-03	2,43E-03
1,07E-02	3,85E-04

Brake Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



At

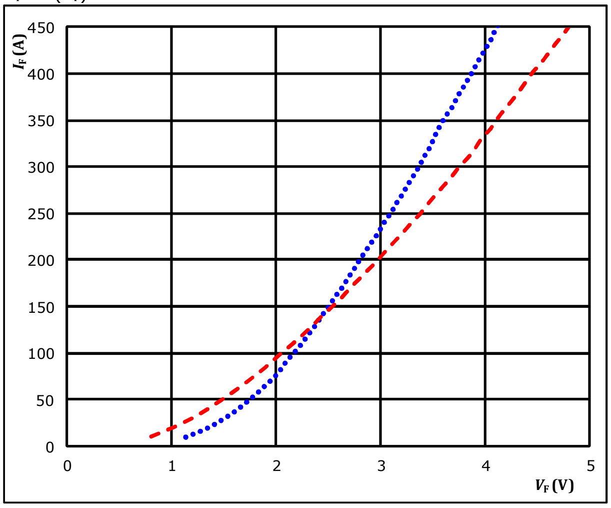
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Brake Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



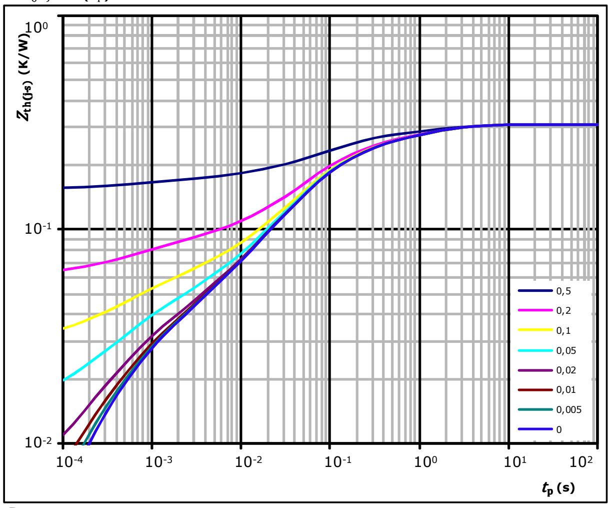
t_p = 250 µs

T_j: 25 °C; 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$



D = t_p / T

$R_{th(j-s)}$ = 0,31 K/W

FWD thermal model values

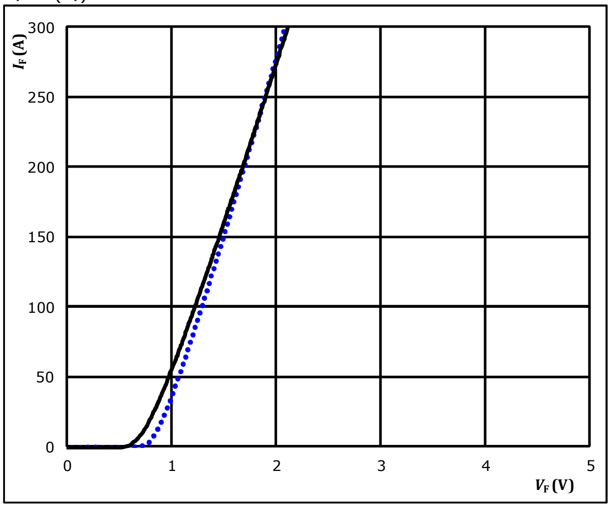
R (K/W)	τ (s)
5,61E-02	1,62E+00
5,67E-02	3,07E-01
1,31E-01	6,80E-02
3,13E-02	1,30E-02
1,79E-02	1,79E-03
1,66E-02	3,53E-04

Rectifier Diode Characteristics

figure 1. **Rectifier Diode**

Typical forward characteristics

$I_F = f(V_F)$



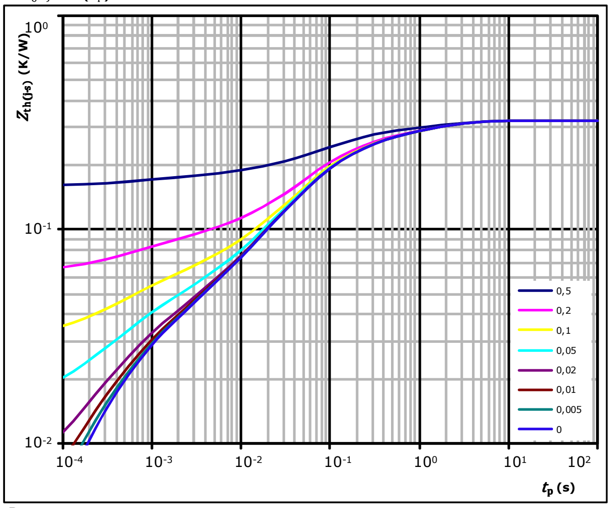
t_p = 250 µs

T_j: 25 °C (dotted), 125 °C (solid)

figure 2. **Rectifier Diode**

Transient thermal impedance as a function of pulse width

$Z_{th(j\text{-}s)} = f(t_p)$



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,32 K/W

Diode thermal model values

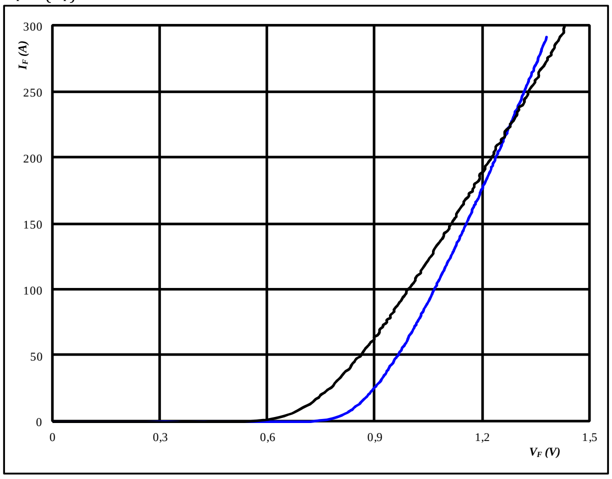
R (K/W)	τ (s)
5,79E-02	1,62E+00
5,86E-02	3,07E-01
1,36E-01	6,80E-02
3,23E-02	1,30E-02
1,85E-02	1,79E-03
1,71E-02	3,53E-04

Rectifier Thyristor Characteristics

figure 1. Thyristor

Typical forward characteristics

$I_F = f(V_F)$

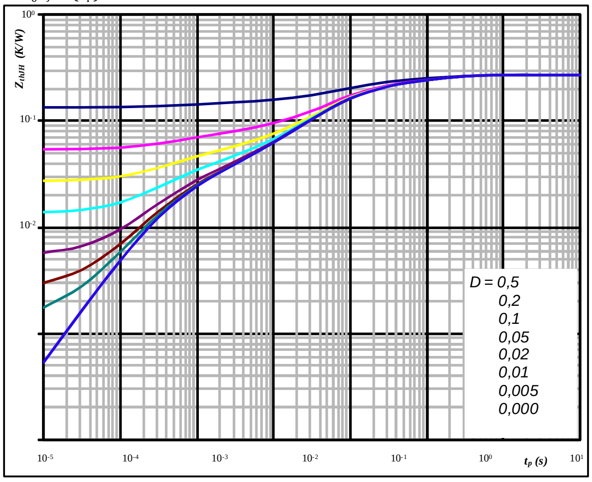


t_p =	250	µs
T_j=	25, 125	°C

figure 2. Thyristor

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$



D =	t_p / T	
$R_{th(j-s)}$ =	0,27	K/W

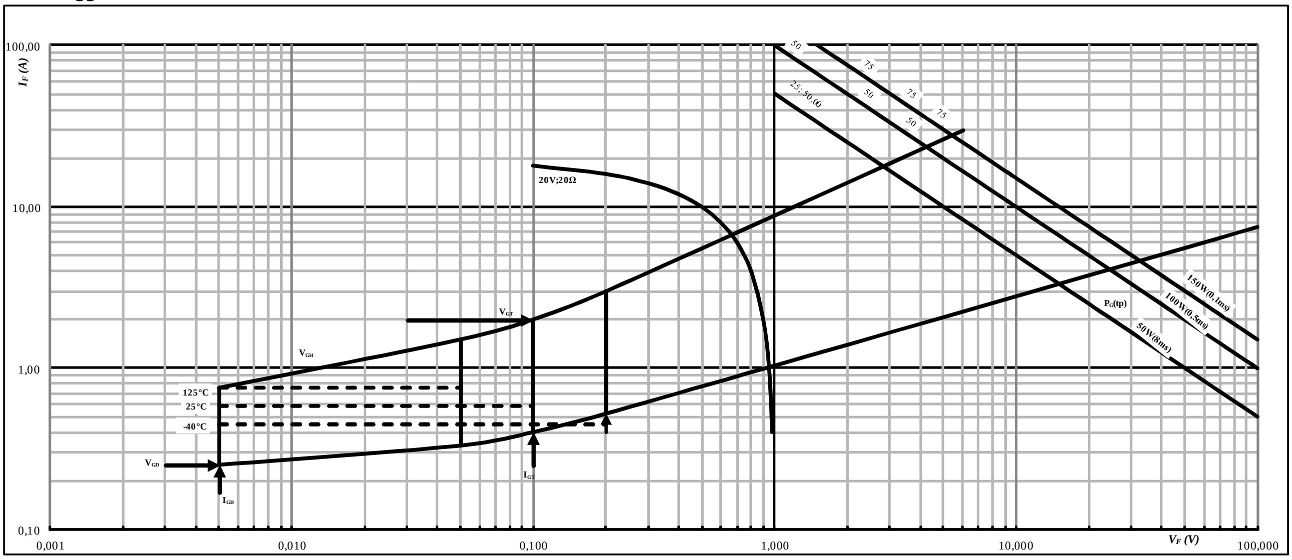
FWD thermal model values

R (K/W)	Tau (s)
4,97E-02	1,62E+00
5,02E-02	3,07E-01
1,16E-01	6,80E-02
2,77E-02	1,30E-02
1,59E-02	1,79E-03
1,31E-02	3,53E-04

Rectifier Thyristor Characteristics

figure 3. Thyristor

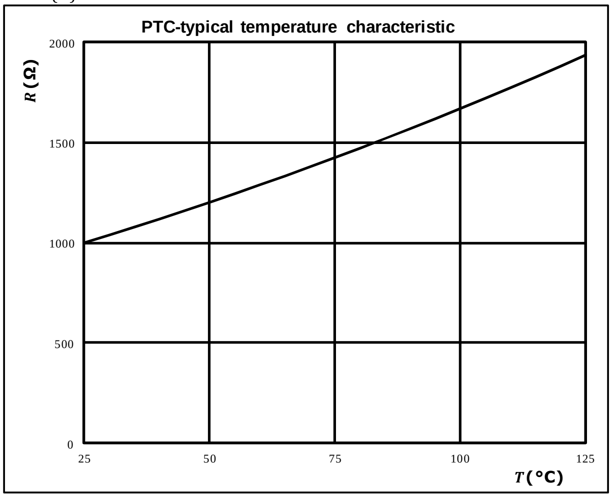
Gate trigger characteristics



PTC Characteristics

figure 1.	**Thermistor**

Typical PTC characteristic
as a function of temperature
$R = f(T)$

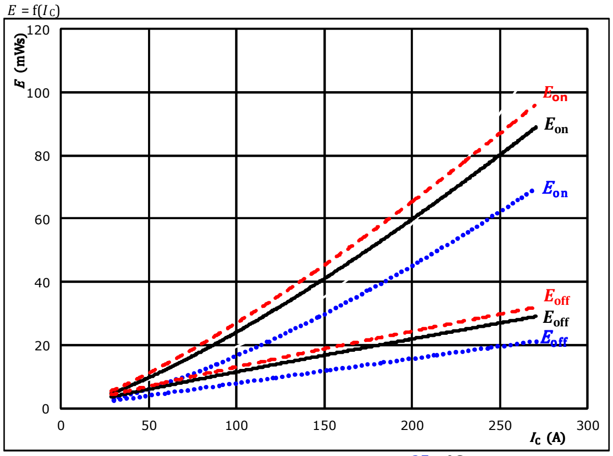


Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



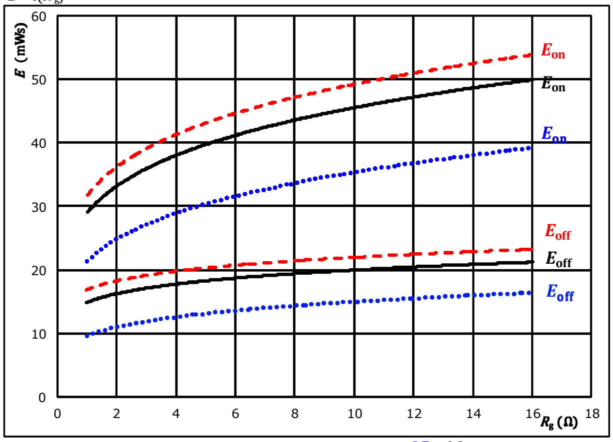
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	15/0	V		125 °C
R_{gon} =	4	Ω		150 °C
R_{goff} =	4	Ω		

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



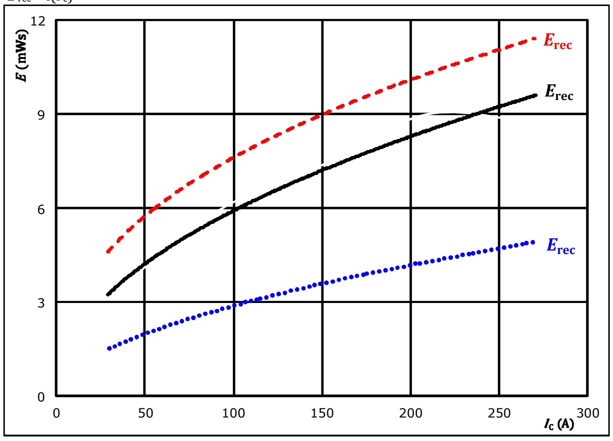
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	15/0	V		125 °C
I_C =	149	A		150 °C

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



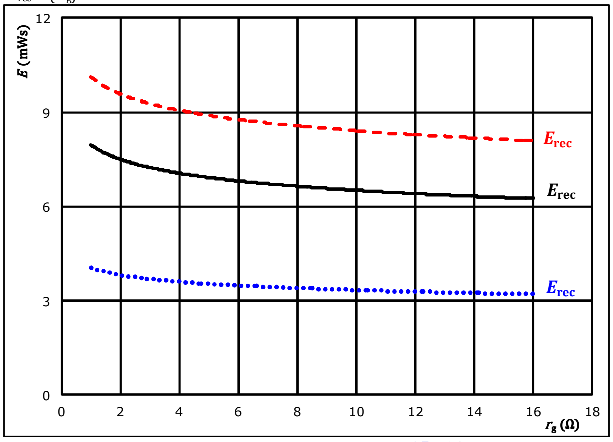
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	15/0	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	15/0	V		125 °C
I_C =	149	A		150 °C

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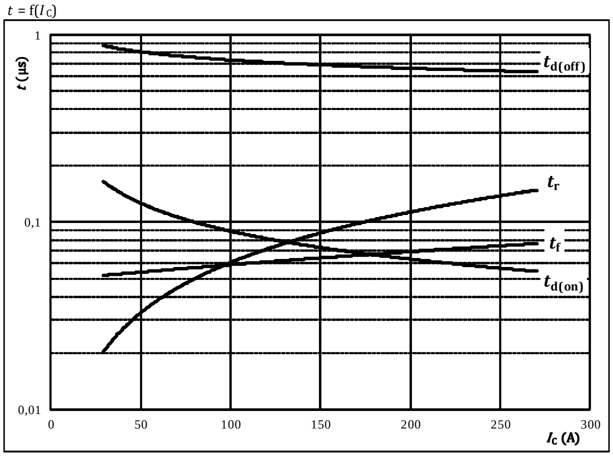
Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



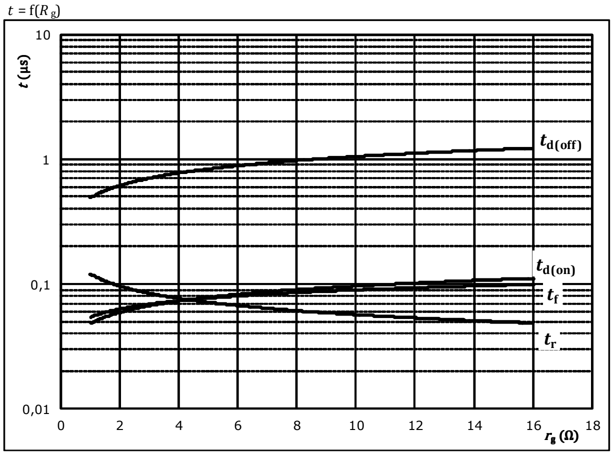
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	15/0	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



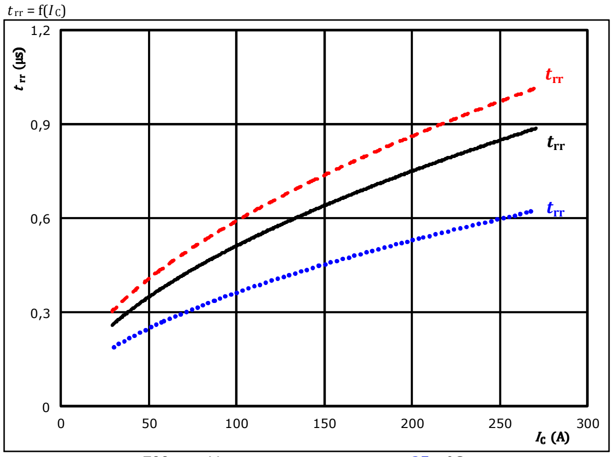
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	15/0	V
I_C =	149	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

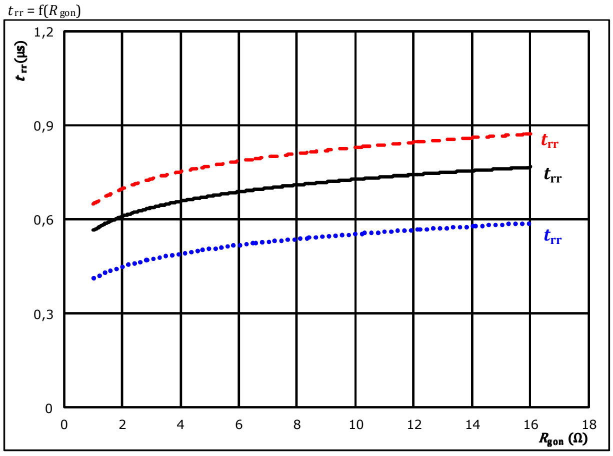


At V_{CE} =	700	V		25 °C	···········
V_{GE} =	15/0	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

figure 8. **FWD**

Typical reverse recovery time as a function of IGBT turn on gate resistor

$t_{rr} = f(R_{gon})$



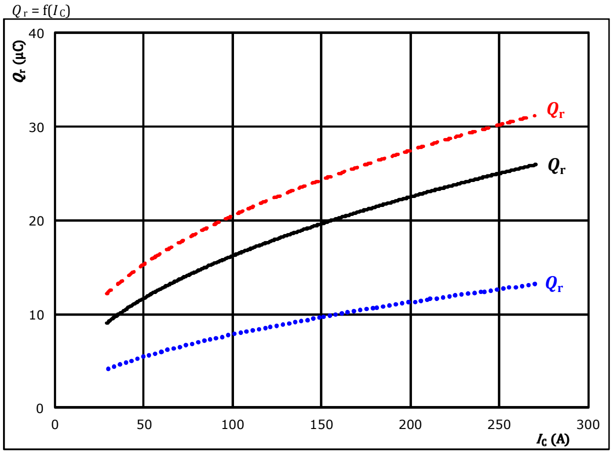
At V_{CE} =	700	V		25 °C	···········
V_{GE} =	15/0	V	T_j:	125 °C	———
I_C =	149	A		150 °C	– – –

Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

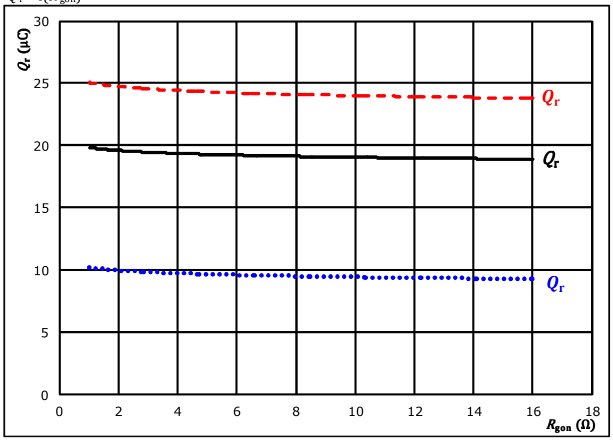


At					
V_{CE} =	700	V	T_j:	25 °C	············
V_{GE} =	15/0	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

figure 10. **FWD**

Typical recoved charge as a function of IGBT turn on gate resistor

$Q_r = f(R_{gon})$

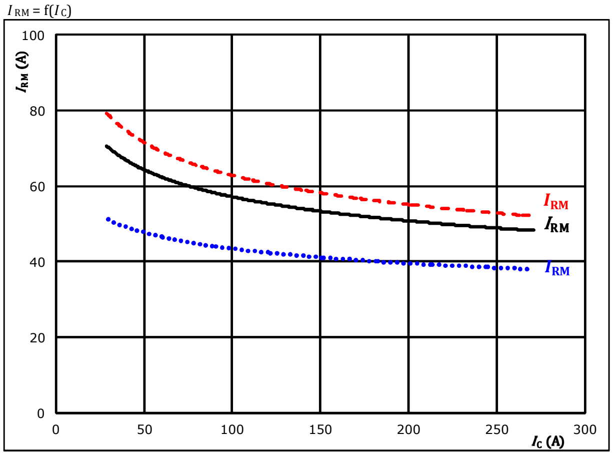


At					
V_{CE}=	700	V	T_j:	25 °C	············
V_{GE} =	15/0	V		125 °C	———
I_C=	149	A		150 °C	– – –

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

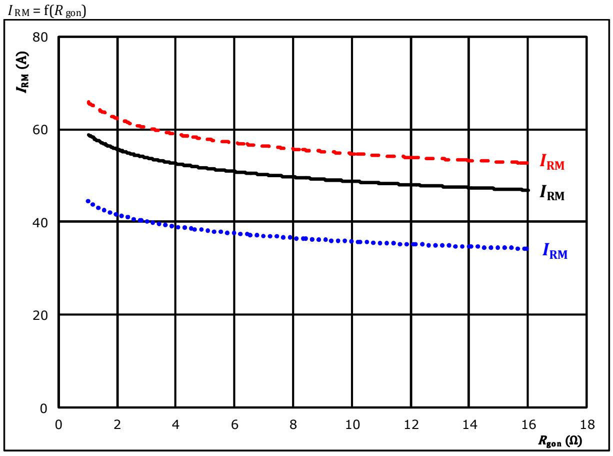


At					
V_{CE}:	700	V	T_j:	25 °C	············
V_{GE} =	15/0	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

figure 12. **FWD**

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$I_{RM} = f(R_{gon})$



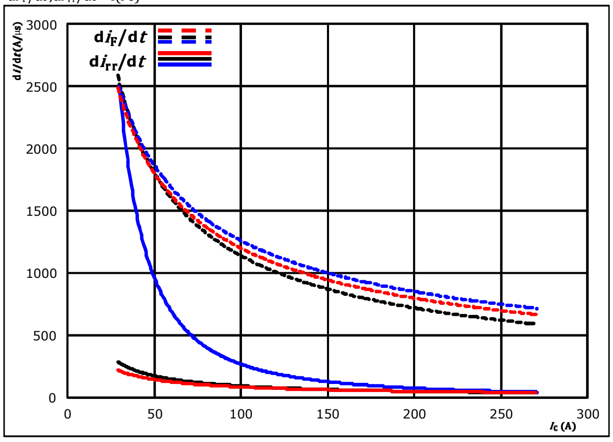
At					
V_{CE} =	700	V	T_j:	25 °C	············
V_{GE} =	15/0	V		125 °C	———
I_C =	149	A		150 °C	– – –

Switching Characteristics

figure 13. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

$di_F/dt, di_{rr}/dt = f(I_C)$

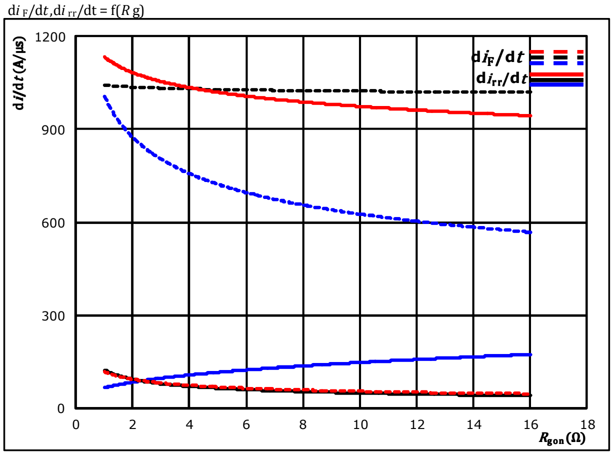


At					
V_{CE} =	700	V		25	°C
V_{GE} =	15/0	V	T_j:	125	°C
R_{gon} =	4	Ω		150	°C

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

$di_F/dt, di_{rr}/dt = f(R_g)$

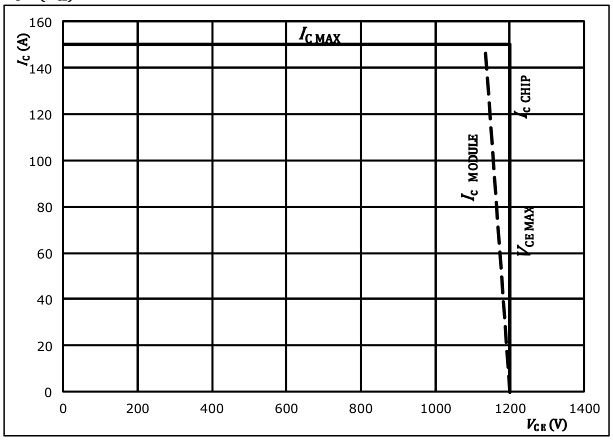


At					
V_{CE} =	700	V		25	°C
V_{GE} =	15/0	V	T_j:	125	°C
I_C =	149	A		150	°C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

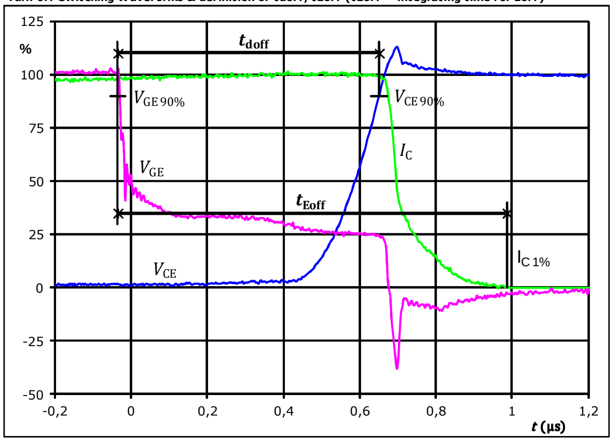
Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1. IGBT

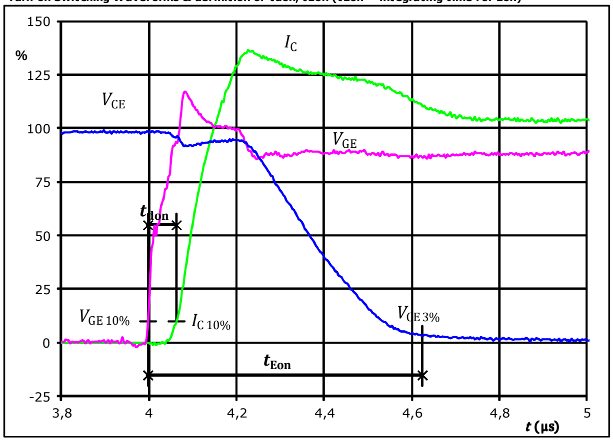
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	151	A
t_{doff} =	0,681	µs
t_{Eoff} =	1,021	µs

figure 2. IGBT

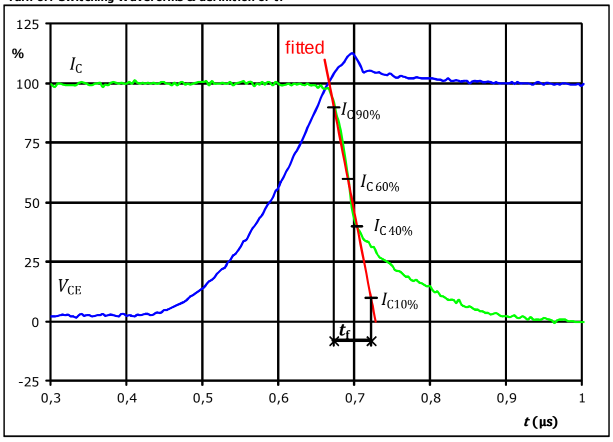
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	151	A
t_{don} =	0,065	µs
t_{Eon} =	0,626	µs

figure 3. IGBT

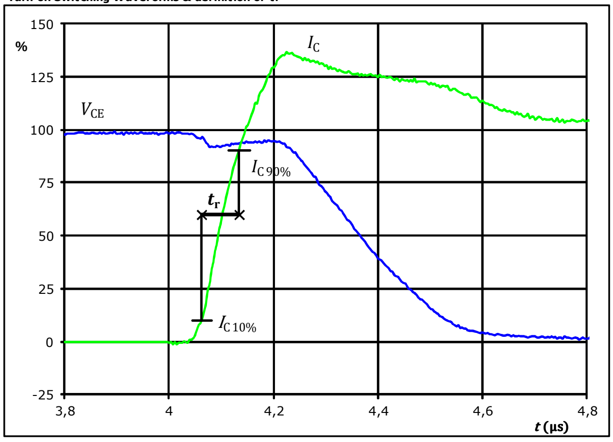
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	151	A
t_f =	0,045	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of tr



$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	151	A
t_r =	0,071	µs

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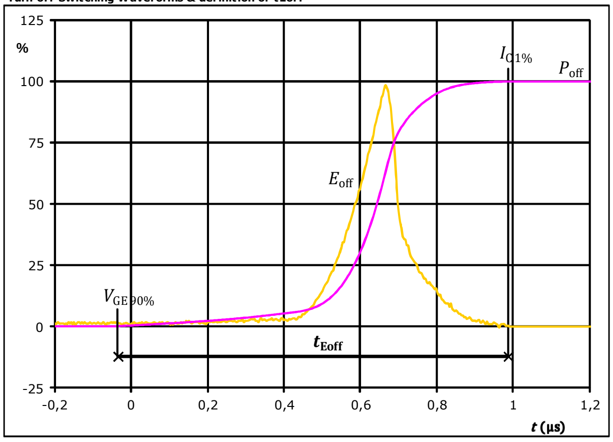
Switching Characteristics

figure 5. **IGBT**

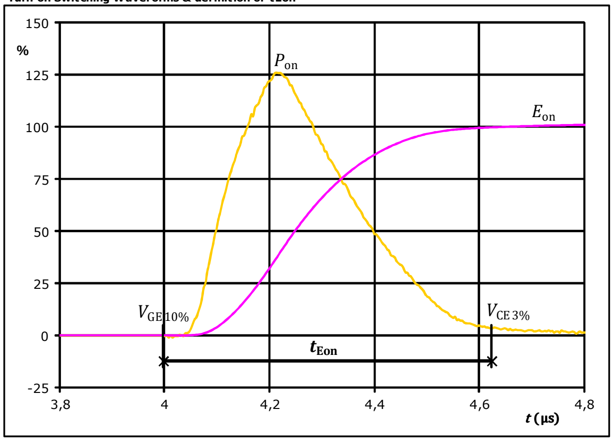
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	105,38	kW
E_{off} (100%) =	16,84	mJ
t_{Eoff} =	1,02	µs

figure 6. **IGBT**

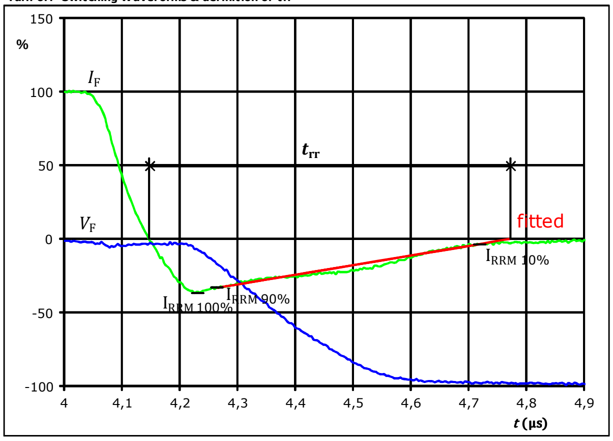
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	105,38	kW
E_{on} (100%) =	35,58	mJ
t_{Eon} =	0,63	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

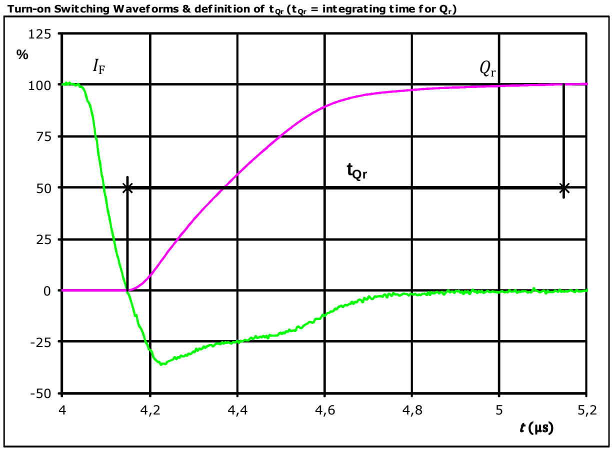


V_F (100%) =	700	V
I_F (100%) =	151	A
I_{RRM} (100%) =	-54	A
t_{rr} =	0,625	µs

Switching Characteristics

figure 8. **FWD**

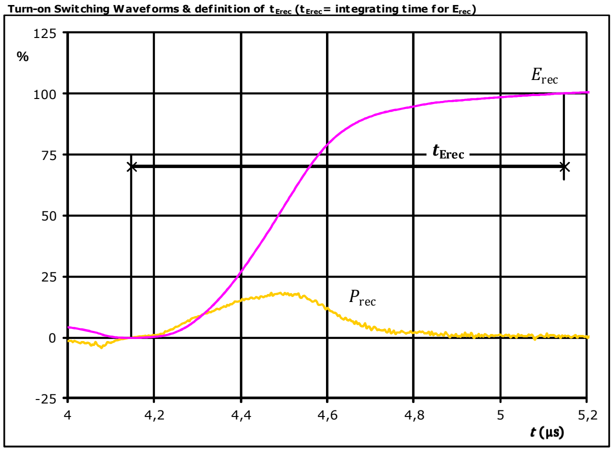
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	151	A
Q_r (100%) =	19,74	µC
t_{Qr} =	1,00	µs

figure 9. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})



P_{rec} (100%) =	105,38	kW
E_{rec} (100%) =	7,41	mJ
t_{Erec} =	1,00	µs

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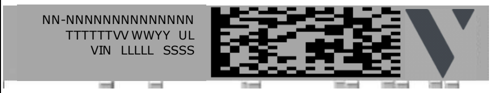
Ordering Code & Marking

Version	Ordering Code
with std lid (black V23990-K32-T-2-PM)	80-M3166BA140SC03-K489G42-/0A/
with std lid (black V23990-K32-T-2-PM)+PCM	80-M3166BA140SC03-K489G42-/3A/
with std lid (black V23990-K32-T-2-PM)+thermal grease	80-M3166BA140SC03-K489G42-/5A/



	Name		Date code	UL & VIN	Lot	Serial
Text	N-NNNNNNNNNNNNNN-TTTTTTV		WWYY	UL VIN	LLLLL	SSSS
	Type&Ver	Lot number	Serial	Date code		
Datamatrix	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

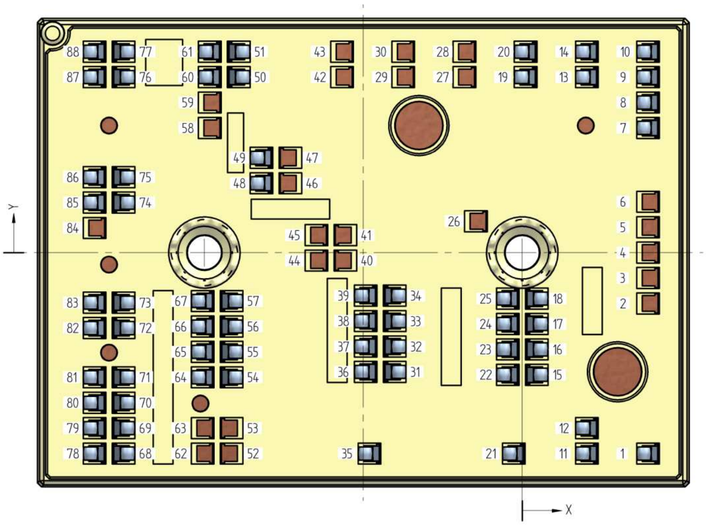
Pad positions refers to center point. For more informations on pad design please see package data.

PCB pad table

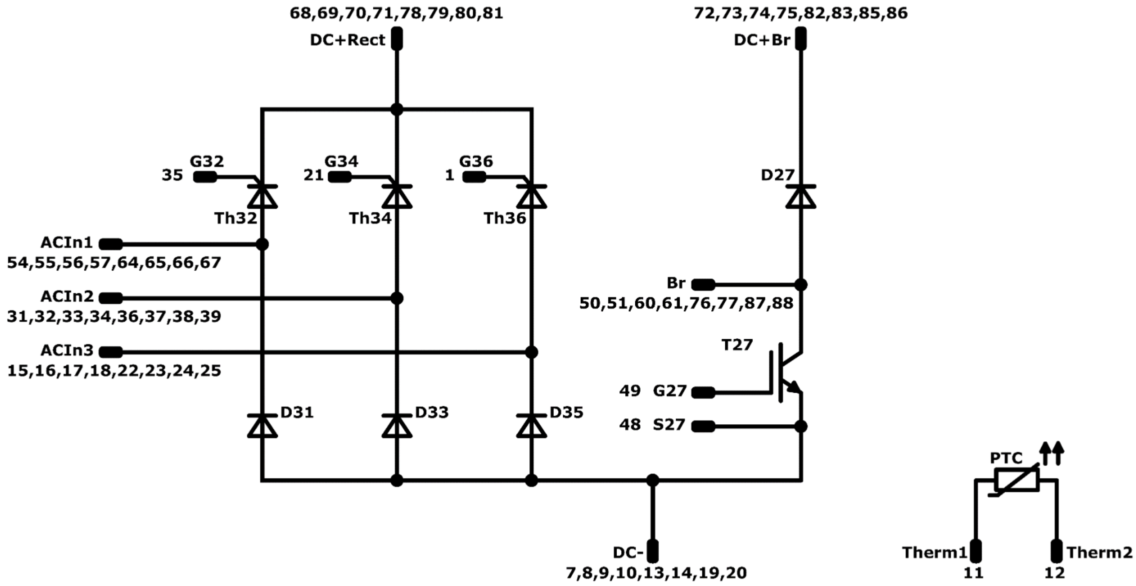
Pin	X	Y	Function
1	15,83	-25,3	G36
2	Not assembled		
3	Not assembled		
4	Not assembled		
5	Not assembled		
6	Not assembled		
7	15,83	15,7	DC-
8	15,83	18,9	DC-
9	15,83	22,1	DC-
10	15,83	25,3	DC-
11	8,13	-25,3	Therm1
12	8,13	-22,1	Therm2
13	8,13	22,1	DC-
14	8,13	25,3	DC-
15	41,82	-15,38	ACIn3
16	41,82	-12,18	ACIn3
17	41,82	-8,98	ACIn3
18	41,82	-5,79	ACIn3
19	0,43	22,1	DC-
20	0,43	25,3	DC-
21	-1,07	-25,3	G34
22	-1,82	-15,38	ACIn3
23	-1,82	-12,18	ACIn3
24	-1,82	-8,98	ACIn3
25	-1,82	-5,79	ACIn3
26	Not assembled		
27	Not assembled		
28	Not assembled		
29	Not assembled		
30	Not assembled		
31	23,95	-15,02	ACIn2
32	23,95	-11,82	ACIn2
33	23,95	-8,63	ACIn2
34	23,95	-5,42	ACIn2
35	-19,22	-25,3	G32
36	-19,7	-15,02	ACIn2
37	-19,7	-11,82	ACIn2
38	-19,7	-8,62	ACIn2
39	-19,7	-5,42	ACIn2
40	Not assembled		
41	Not assembled		
42	Not assembled		
43	Not assembled		
44	Not assembled		
45	Not assembled		
46	Not assembled		
47	Not assembled		
48	-32,82	8,74	S27
49	-32,82	11,94	G27
50	4,32	22,1	Br
51	4,32	25,3	Br

PCB pad table

Pin	X	Y	Function
52	Not assembled		
53	Not assembled		
54	3,42	-15,7	ACIn1
55	3,42	-12,5	ACIn1
56	3,42	-9,3	ACIn1
57	3,42	-6,1	ACIn1
58	Not assembled		
59	Not assembled		
60	-39,32	22,1	Br
61	-39,32	25,3	Br
62	Not assembled		
63	Not assembled		
64	-40,22	-15,7	ACIn1
65	-40,22	-12,5	ACIn1
66	-40,22	-9,3	ACIn1
67	-40,22	-6,09	ACIn1
68	-10,18	-25,3	DC+Rect
69	-10,18	-22,1	DC+Rect
70	-10,18	-18,9	DC+Rect
71	-10,18	-15,7	DC+Rect
72	-10,18	-9,5	DC+Br
73	-10,18	-6,3	DC+Br
74	-10,18	6,3	DC+Br
75	-10,18	9,5	DC+Br
76	-10,18	22,1	Br
77	-10,18	25,3	Br
78	-53,82	-25,3	DC+Rect
79	-53,82	-22,1	DC+Rect
80	-53,82	-18,9	DC+Rect
81	-53,82	-15,7	DC+Rect
82	-53,82	-9,5	DC+Br
83	-53,82	-6,3	DC+Br
84	Not assembled		
85	-53,82	6,3	DC+Br
86	-53,82	9,5	DC+Br
87	-53,82	22,1	Br
88	-53,82	25,3	Br



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T27	IGBT	1200 V	150 A	Brake Switch	
D27	FWD	1200 V	150 A	Brake Diode	
D31, D33, D35	Rectifier	1600 V	140 A	Rectifier Diode	
Th32, Th34, Th36	Thyristor	1600 V	125 A	Rectifier Thyristor	
PTC	PTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 48	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for MiniSkiiP® 3 packages see vincotech.com website.

Package data
Package data for MiniSkiiP® 3 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
80-M3166BA140SC03-K489G42-D2-14	10 Aug. 2017		