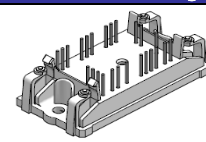
flowCON 0 — 1200V / 50A

Features

- Input rectifier
- Optionally with brake chopper
- Vincotech clip-in housing

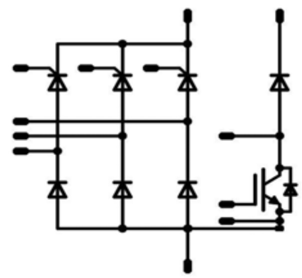
flow0 housing



Target Applications

- Motor drives
- UPS

Schematic



Types

- V23990-P649-G10-PM with brake chopper
- V23990-P649-H10-PM without brake chopper

Maximum Ratings

Parameter	Symbol	Condition	Value	Unit
Input Rectifier Diode				
Repetitive peak reverse voltage	V_{RRM}		1600	V
Forward current per diode	I_{FAV}	DC current $T_j=T_j$max $T_h=80°C$	50	A
Surge forward current	I_{FSM}	$t_p=10ms$ half sine wave $T_j=45°C$	600	A
I^2t-value	I^2t	$t_p=10ms$ half sine wave $T_j=45°C$	1800	A^2s
Power dissipation per Diode	P_{tot}	$T_j=T_j$max $T_h=80°C$	60	W
Maximum junction temperature	$T_j$max		150	°C
Input Rectifier Thyristor				
Repetitive peak reverse voltage	V_{RRM}	$T_j=25ºC$	1600	V
Forward average current	I_{FAV}	DC current $T_j=T_j$max $T_h=80°C$	34	A
Surge forward current	I_{FSM}	$t_p=10ms$ half sine wave $T_j=130°C$	340	A
I^2t-value	I^2t	$t_p=10ms$ half sine wave $T_j=130°C$	575	A^2s
Power dissipation per Thyristor	P_{tot}	$T_j=T_j$max $T_h=80°C$	43	W
Maximum junction temperature	$T_j$max		130	°C

Maximum Ratings

Parameter	Symbol	Condition		Value	Unit
Transistor BRC	Not included in V23990-P649-H10-PM model				
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	T_j=$T_j$max	T_h=80°C	25	A
Repetitive peak collector current	I_{cpuls}	t_p limited by $T_j$max	T_h=80°C	75	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max	T_h=80°C	57	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings*	t_{SC} V_{CC}	T_j≤150°C V_{GE}=15V		10 1200	µs V
Maximum junction temperature	$T_j$max			150	°C

* It is recommended to not exceed 1000 short circuit situations in the lifetime of the module and to allow at least 1s between short circuits

Parameter	Symbol	Condition		Value	Unit
BRC inverse diode	Not included in V23990-P649-H10-PM model				
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25ºC		1200	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C	6	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		6	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C	18	W
Maximum junction temperature	$T_j$max			150	°C
Diode BRC	Not included in V23990-P649-H10-PM model				
Peak Repetitive Reverse Voltage	V_{RRM}	Tj=25ºC		1200	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C	15	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		30	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C	33	W
Maximum junction temperature	$T_j$max			150	°C
Thermal properties					
Storage temperature	T_{stg}			-40...+125	°C
Operation temperature	T_{op}			-40...+110	°C

Maximum Ratings

Parameter	Symbol	Condition	Value	Unit
Insulation properties				
Insulation voltage	V_{is}	t=1min	4000	Vdc
Creepage distance			min 12.7	mm
Clearance			min 12.7	mm

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE}(V) or V_{GS}(V)	V_r(V) or V_{CE}(V) or V_{DS}(V)	I_C(A) or I_F(A) or I_D(A)	T(°C)	Min	Typ	Max	
Input Rectifier Bridge										
Forward voltage	V_F				50	Tj=25°C Tj=125°C	1	1,14 1,09	1,5	V
Threshold voltage (for power loss calc. only)	V_{to}					Tj=25°C Tj=125°C		0,90 0,77		V
Slope resistance (for power loss calc. only)	r_t					Tj=25°C Tj=125°C		5 7		mΩ
Reverse leakage current	I_r			1500		Tj=25°C Tj=125°C			0,02 3	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness ≤50um λ= 0.61W/mK						1,17		K/W
Thermal resistance chip to case per chip	R_{thJC}							n.A.		K/W
Input Rectifier Thyristor										
Forward voltage	V_F				50	Tj=25°C Tj=125°C	1	1,37 1,45	1,85	V
Threshold voltage (for power loss calc. only)	V_{to}					Tj=25°C Tj=125°C		0,91 0,83		V
Slope resistance (for power loss calc. only)	r_t					Tj=25°C Tj=125°C		9 12		mΩ
Reverse current	I_r			1500		Tj=25°C Tj=125°C			0,2	mA
Gate controlled delay time	t_{GD}	Ig=1A dig/dt=1A/s		1072		Tj=25°C Tj=125°C		1		µs
Gate controlled rise time	t_{GR}	Ig=1A dig/dt=1A/s		1072		Tj=25°C Tj=125°C		2		µs
Critical rate of rise of off-state voltage	(dv/dt)cr					Tj=25°C Tj=130°C			1000	V/µs
Critical rate of rise of on-state current	(di/dt)cr					Tj=25°C Tj=130°C			50	A/µs
Circuit-commutated turn-off time	t_q					Tj=25°C Tj=130°C		150		µs
Holding current	I_H					Tj=25°C Tj=125°C			165	mA
Latching current	I_L					Tj=25°C Tj=125°C			330	mA
Gate trigger voltage	V_{GT}					Tj=25°C Tj=125°C			1,98	V
Gate trigger current	I_{GT}					Tj=25°C Tj=125°C			100	mA
Gate non-trigger voltage	V_{GD}					Tj=25°C Tj=130°C	0,25			V
Gate non-trigger current	I_{GD}					Tj=25°C Tj=115°C	6			mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness ≤50um λ= 0.61W/mK						1,28		K/W
Thermal resistance chip to case per chip	R_{thJC}							n.A.		K/W

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE}(V) or V_{GS}(V)	V_r(V) or V_{CE}(V) or V_{DS}(V)	I_C(A) or I_F(A) or I_D(A)	T(°C)	Min	Typ	Max	
Transistor BRC										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,001	Tj=25°C Tj=125°C	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		25	Tj=25°C Tj=125°C	1,3	1,63 1,84	2,2	V
Collector-emitter cut-off	I_{CES}		0	1200		Tj=25°C Tj=125°C			0,25	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=125°C			650	nA
Integrated Gate resistor	R_{gint}							8		Ω
Turn-on delay time	$t_{d(on)}$	R_{gon}=32Ω R_{goff}=16Ω	15	600	25	Tj=25°C Tj=125°C		53		ns
Rise time	t_r					Tj=25°C Tj=125°C		21		ns
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		617		ns
Fall time	t_f					Tj=25°C Tj=125°C		183		ns
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		1,97		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		2,85		mWs
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		1,808		nF
Output capacitance	C_{oss}							0,095		nF
Reverse transfer capacitance	C_{rss}							0,082		nF
Gate charge	Q_{Gate}		15	960	25	Tj=25°C		155		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness ≤50um λ= 0.61W/mK						1,24		K/W
Thermal resistance chip to case per chip	R_{thJC}							n.A.		K/W

Characteristic Values

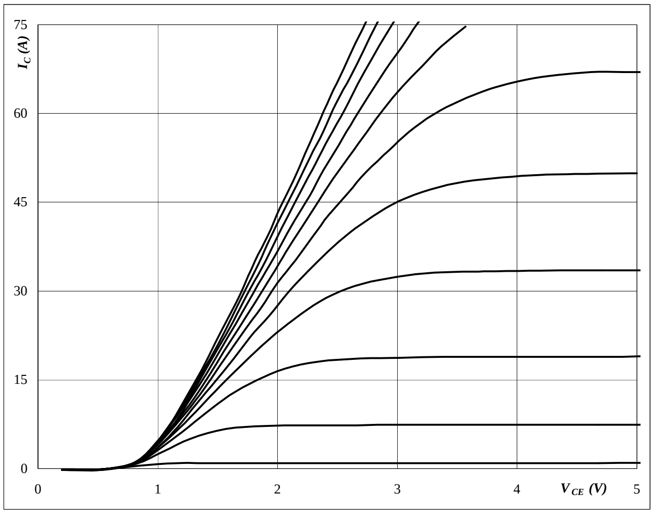
Parameter	Symbol	Conditions					Value			Unit
			V_{GE}(V) or V_{GS}(V)	V_r(V) or V_{CE}(V) or V_{DS}(V)	I_C(A) or I_F(A) or I_D(A)	T(°C)	Min	Typ	Max	
BRC inverse diode										
Diode forward voltage	V_F				3	Tj=25°C Tj=125°C	1	1,65 1,58	2,3	V
Reverse leakage current	I_r			1200		Tj=25°C Tj=125°C			250	μA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness ≤50um λ= 0.61W/mK						3,8		K/W
Thermal resistance chip to case per chip	R_{thJC}							n.A.		K/W
Diode BRC										
Diode forward voltage	V_F				25	Tj=25°C Tj=125°C	1	1,75 1,69	2,4	V
Reverse leakage current	I_r			1200		Tj=25°C Tj=125°C			250	μA
Peak reverse recovery current	I_{RRM}	R_{gon}=32Ω R_{goff}=16Ω	15	600	25	Tj=25°C Tj=125°C		44,2		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		196		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		3,44		μC
Peak rate of fall of reverse recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		2371		A/μs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=125°C		1,34		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness ≤50um λ= 0.61W/mK						2,11		K/W
Thermal resistance chip to case per chip	R_{thJC}							n.A.		K/W

Brake

Figure 1 Brake IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

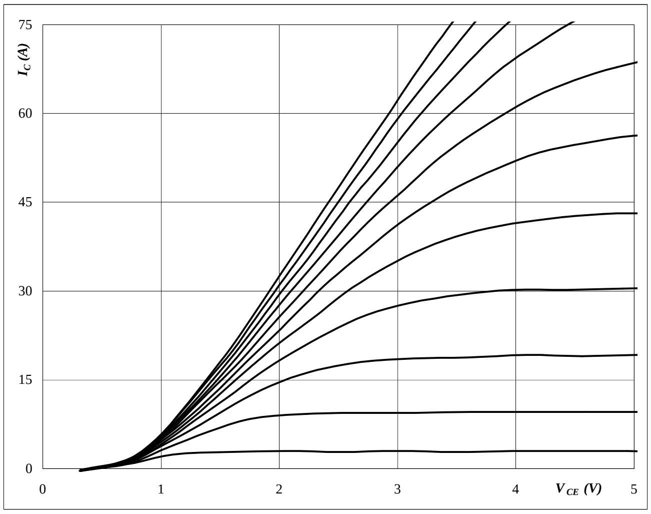
t_p =	250	μs
T_j =	25	°C

VGE from 7 V to 17 V in steps of 1 V

Figure 2 Brake IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

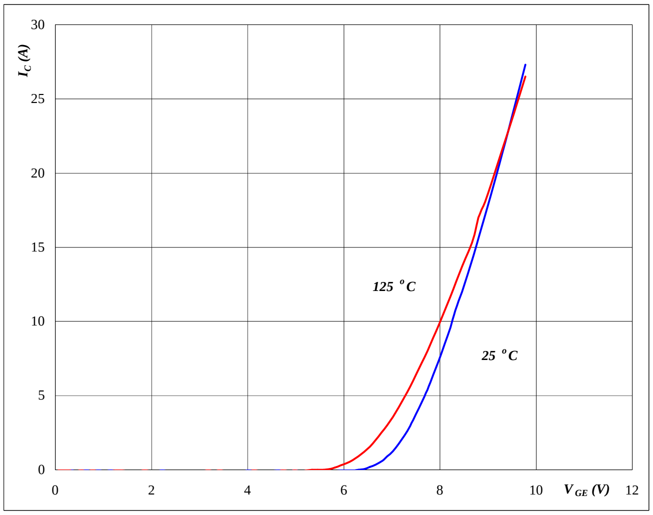
t_p =	250	μs
T_j =	125	°C

VGE from 7 V to 17 V in steps of 1 V

Figure 3 Brake IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



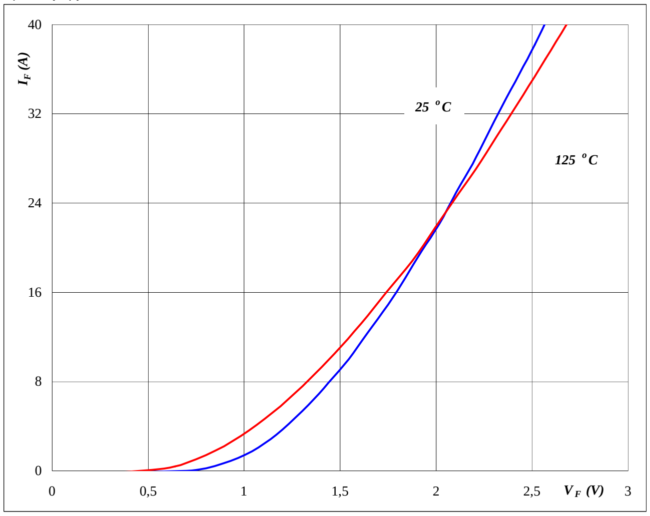
At

t_p =	250	μs
V_{CE} =	10	V

Figure 4 Brake FRED

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

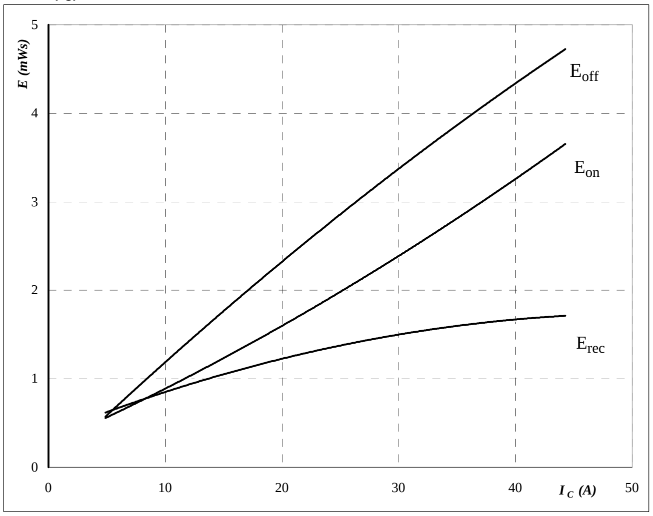
t_p =	250	μs

Brake

Figure 5	Brake IGBT

Typical switching energy losses as a function of collector current

E = f(I_C)



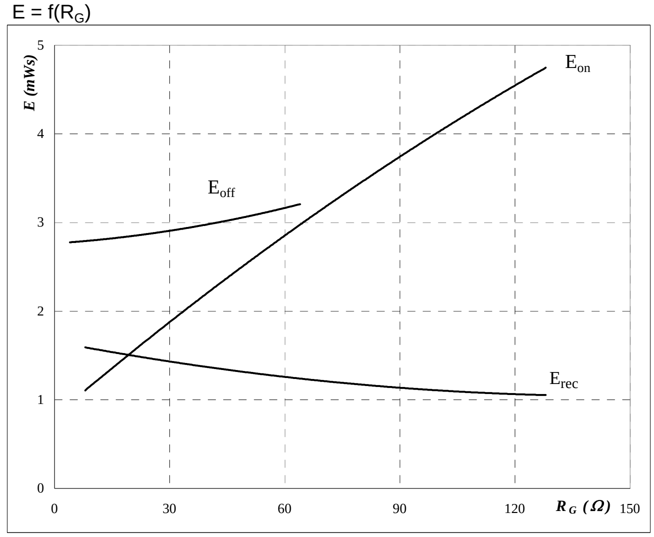
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	15	V
R_{gon} =	32	Ω
R_{goff} =	16	Ω

Figure 6	Brake IGBT

Typical switching energy losses as a function of gate resistor

E = f(R_G)



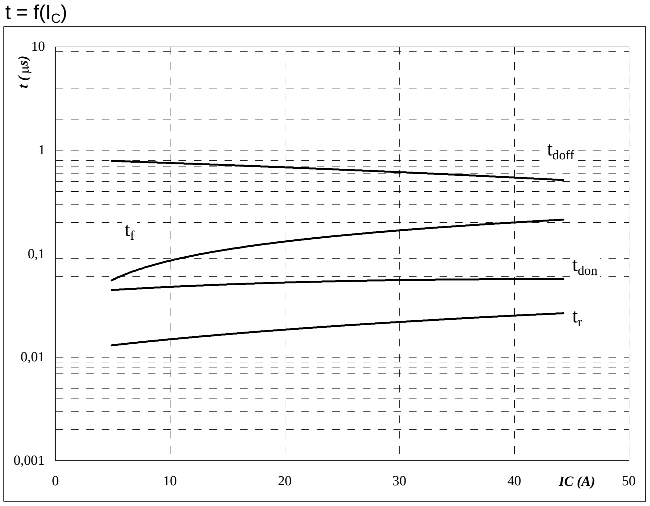
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	15	V
I_C =	24	A

Figure 7	Brake IGBT

Typical switching times as a function of collector current

t = f(I_C)



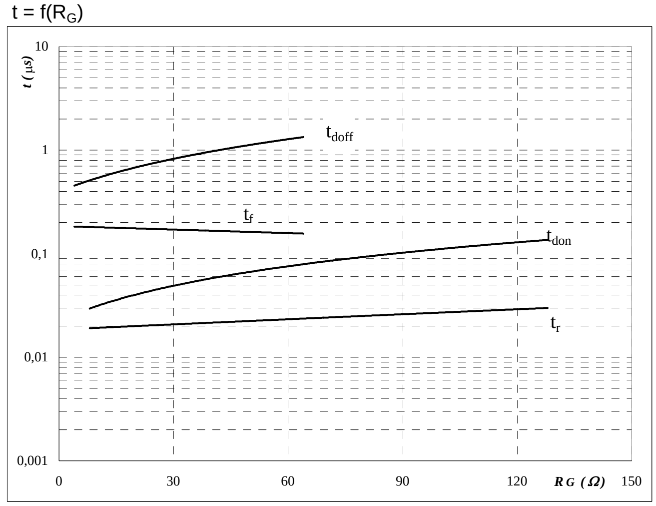
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	15	V
R_{gon} =	32	Ω
R_{goff} =	16	Ω

Figure 8	Brake IGBT

Typical switching times as a function of gate resistor

t = f(R_G)



With an inductive load at

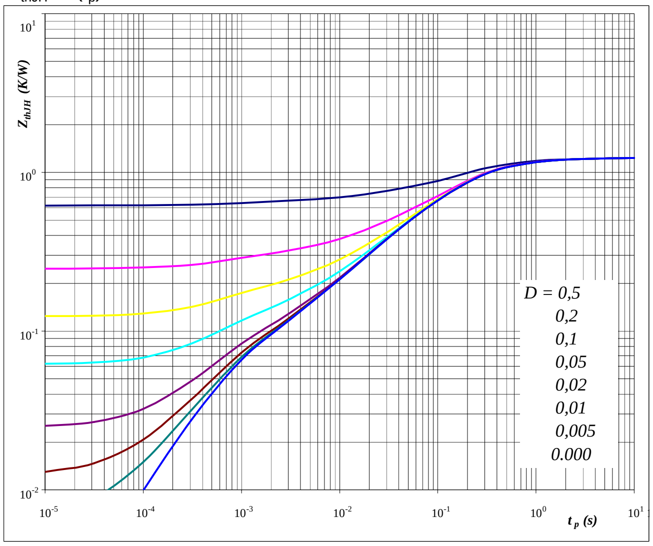
T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	15	V
I_C =	24	A

Brake

Figure 9

IGBT transient thermal impedance
as a function of pulse width

$Z_{thJH} = f(t_p)$



With

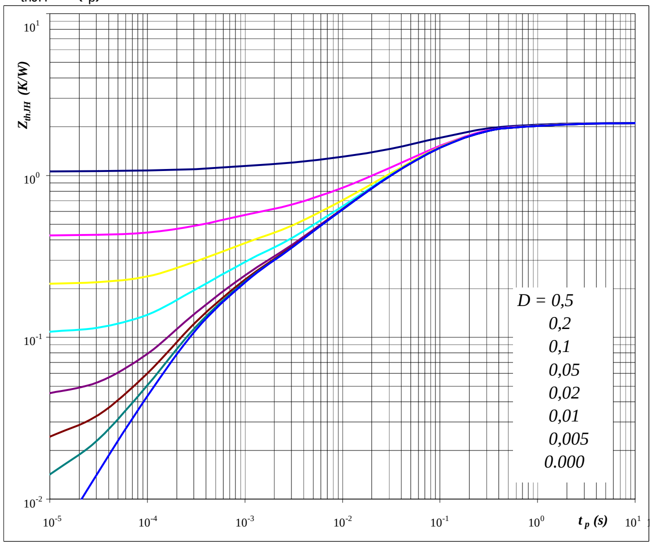
D = tp / T

R_{thJH} = 1,24 K/W

Figure 10

FRED transient thermal impedance
as a function of pulse width

$Z_{thJH} = f(t_p)$



With

D = tp / T

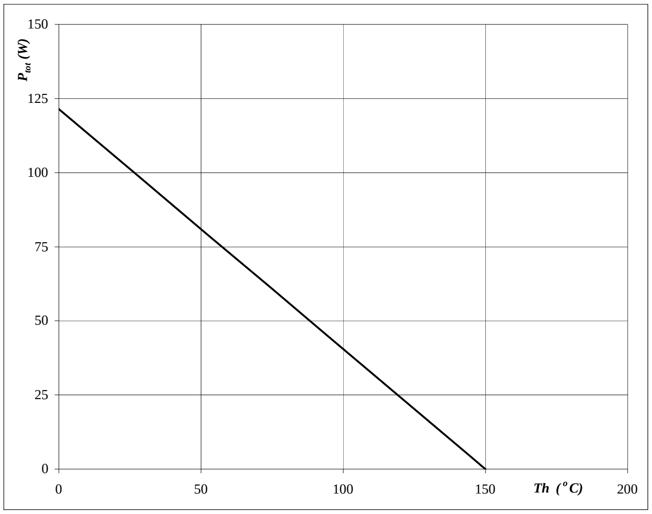
R_{thJH} = 2,11 K/W

Brake

Figure 11 Brake IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



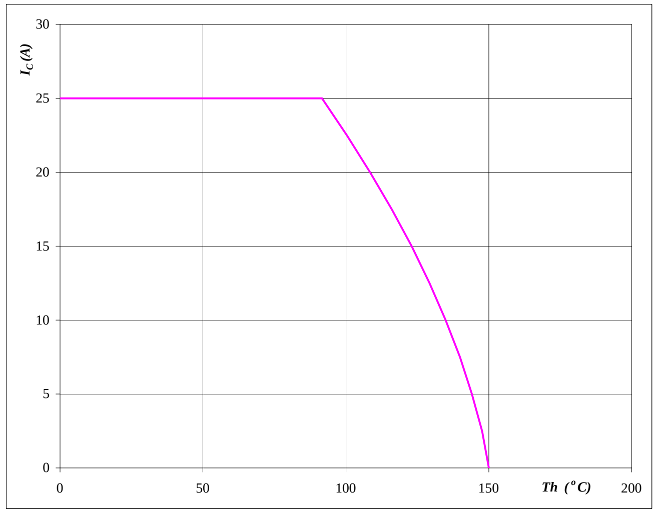
At

T_j = 150 ºC

Figure 12 Brake IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

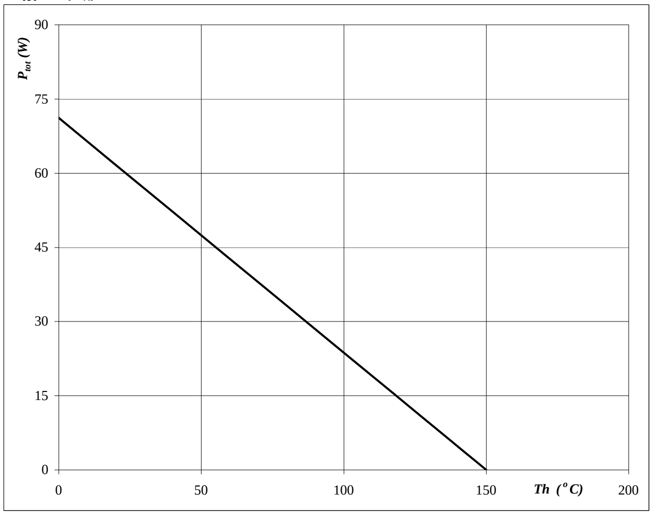
T_j = 150 ºC

V_{GE} = 15 V

Figure 13 Brake FRED

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



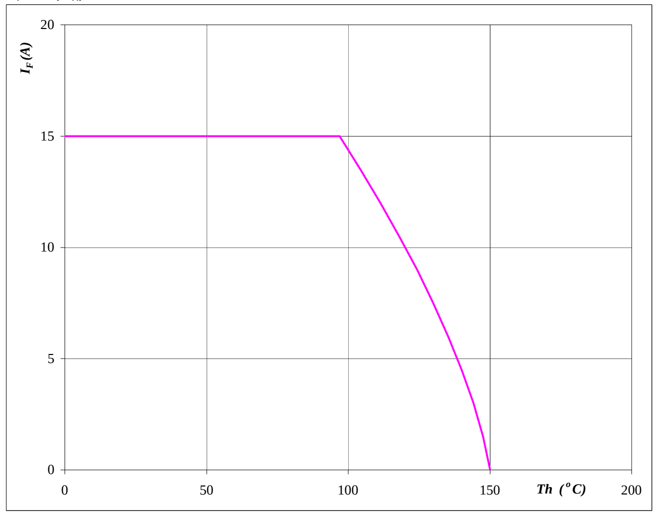
At

T_j = 150 ºC

Figure 14 Brake FRED

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

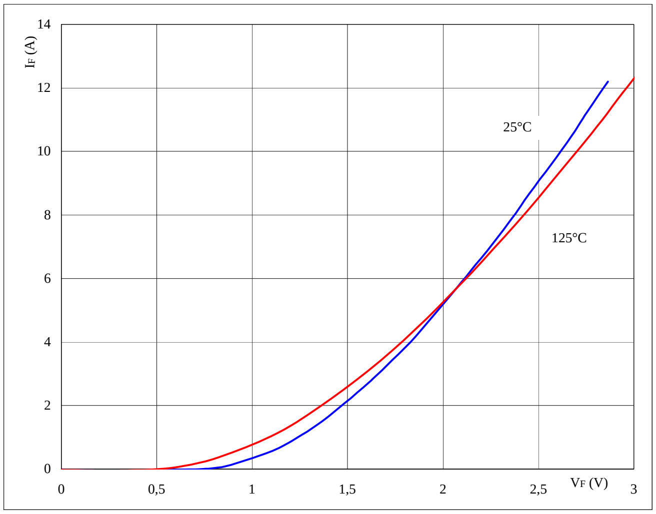
T_j = 150 ºC

Brake Inverse Diode

Figure 1 Brake inverse diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



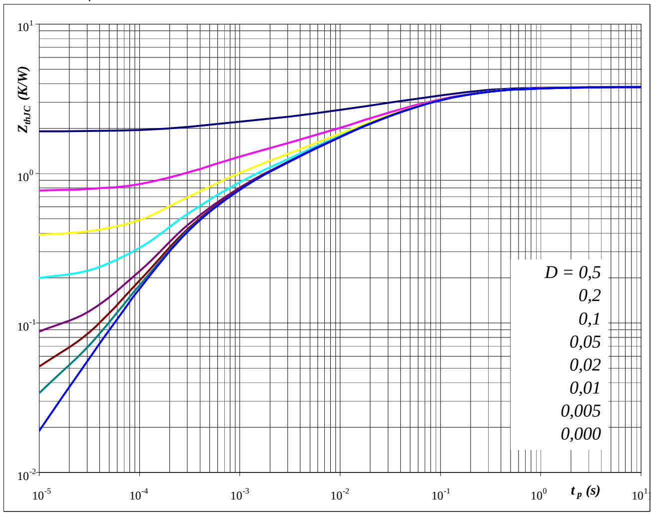
At

t_p = 250 µs

Figure 2 Brake inverse diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



With

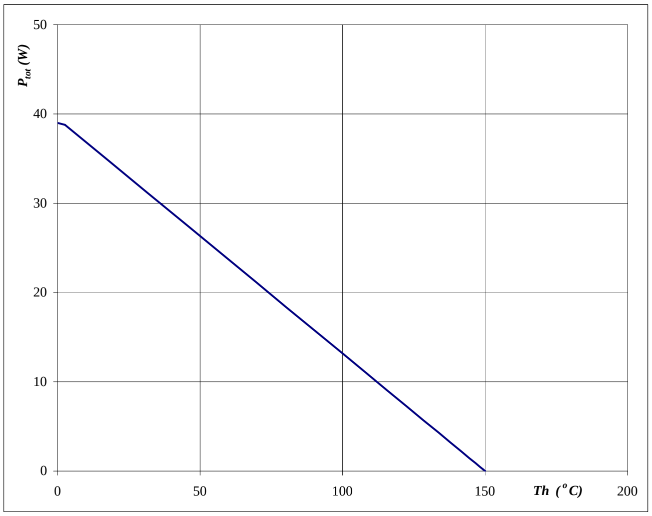
D = tp / T

R_{thJH} = 3,80 K/W

Figure 3 Brake inverse diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



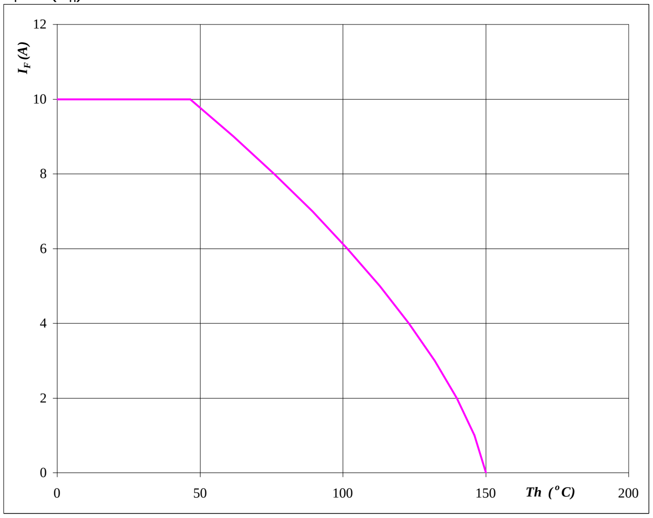
At

T_j = 150 ºC

Figure 4 Brake inverse diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

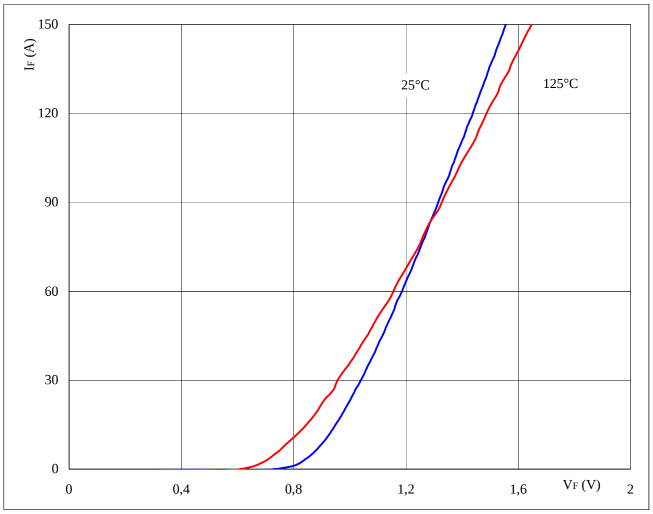
T_j = 150 ºC

Input Rectifier Bridge

Figure 1 Rectifier diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



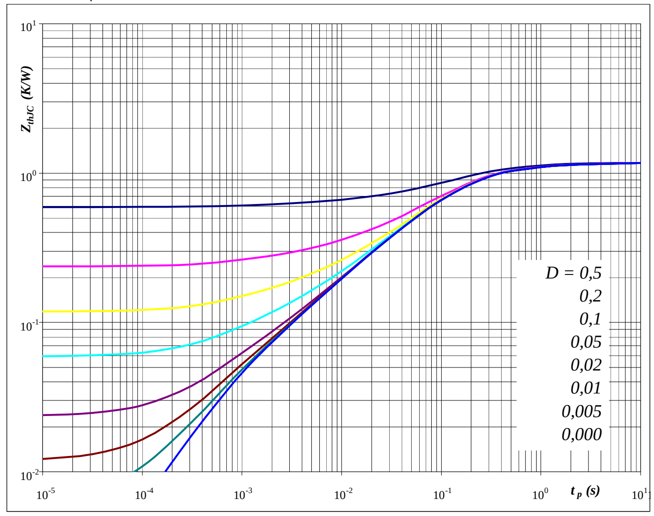
At

t_p = 250 μs

Figure 2 Rectifier diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



With

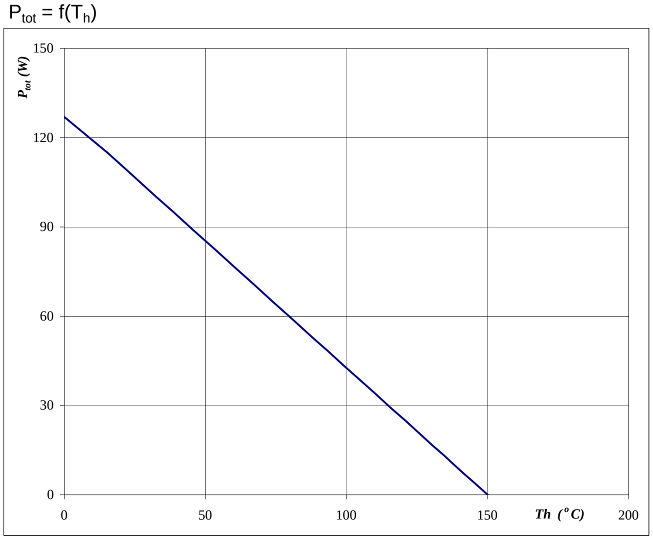
D = tp / T ű

R_{thJH} = 1,17 K/W

Figure 3 Rectifier diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



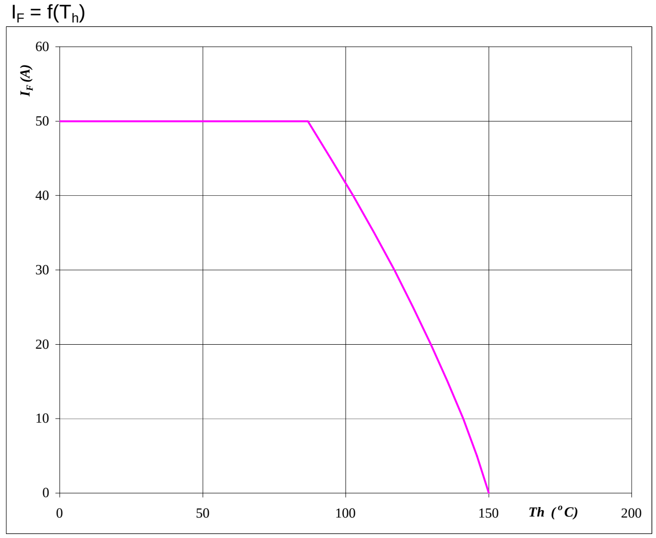
At

T_j = 150 ºC

Figure 4 Rectifier diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

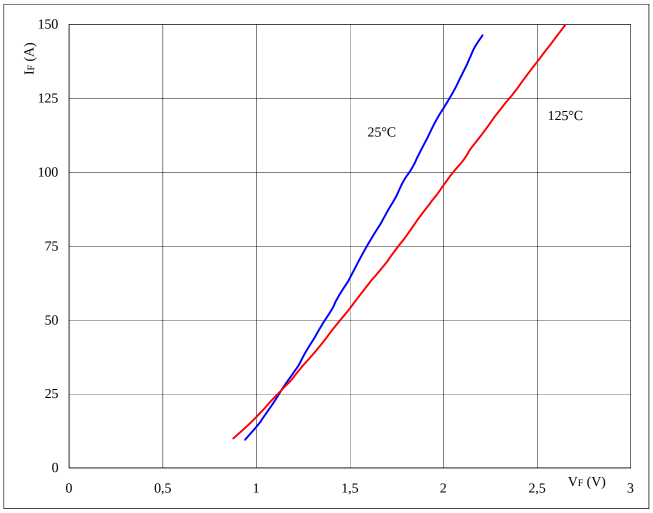
T_j = 150 ºC

Thyristor

Figure 1 Thyristor

Typical thyristor forward current as a function of forward voltage

$I_F = f(V_F)$



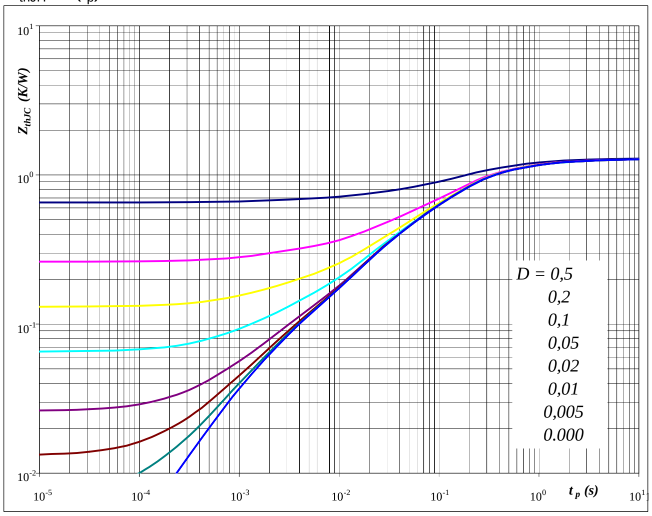
At

t_p = 250 µs

Figure 2 Thyristor

Thyristor transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



With

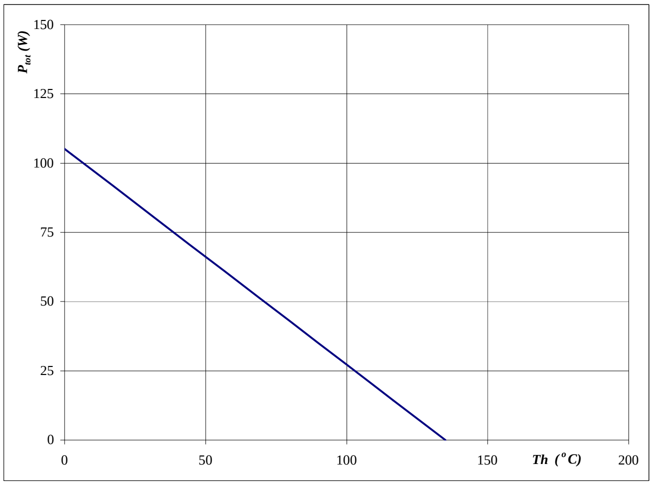
D = tp / T

R_{thJH} = 1,28 K/W

Figure 3 Thyristor

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



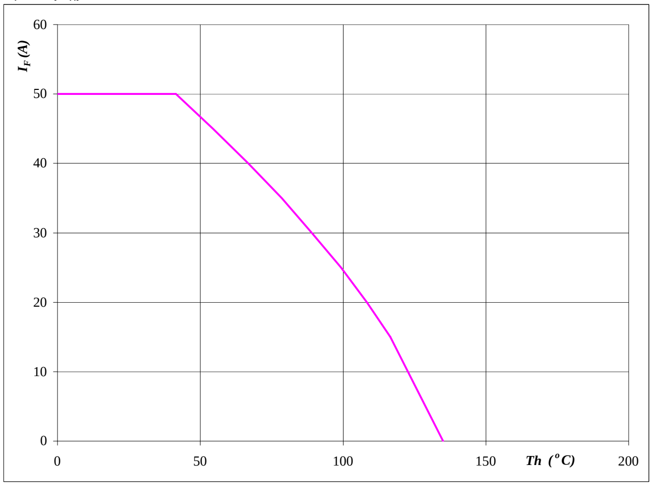
At

T_j = 135 ºC

Figure 4 Thyristor

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



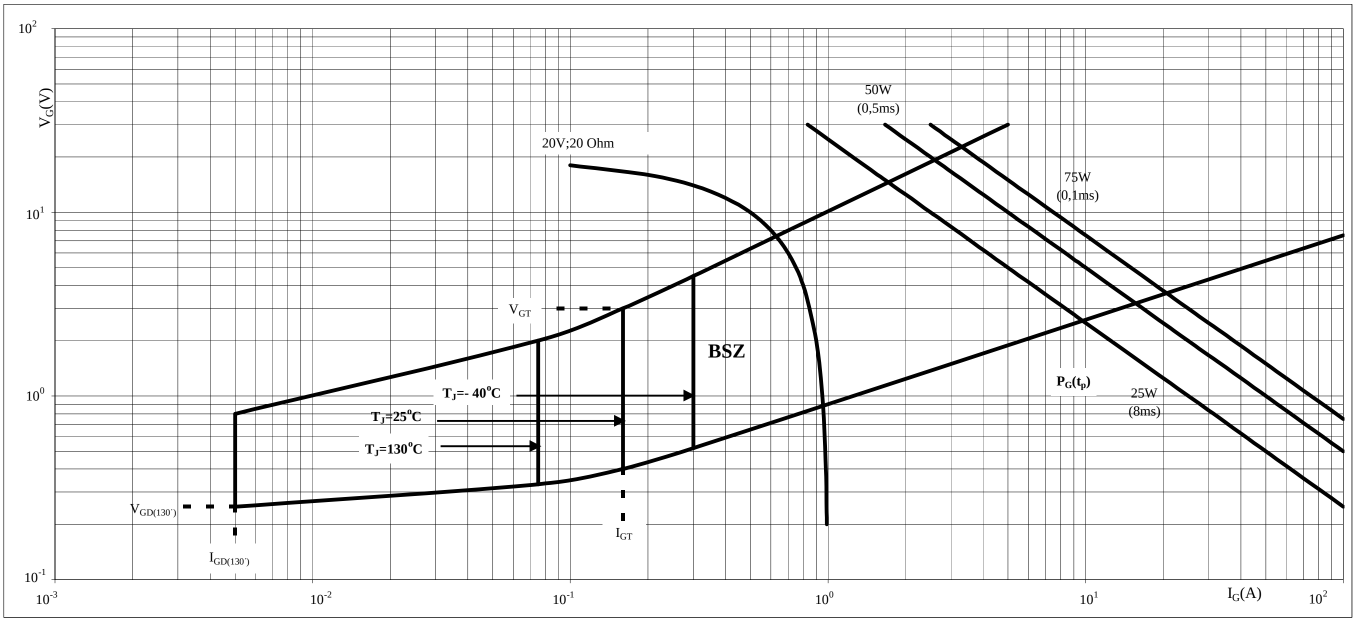
At

T_j = 135 ºC

Thyristor

Figure 5	Thyristor

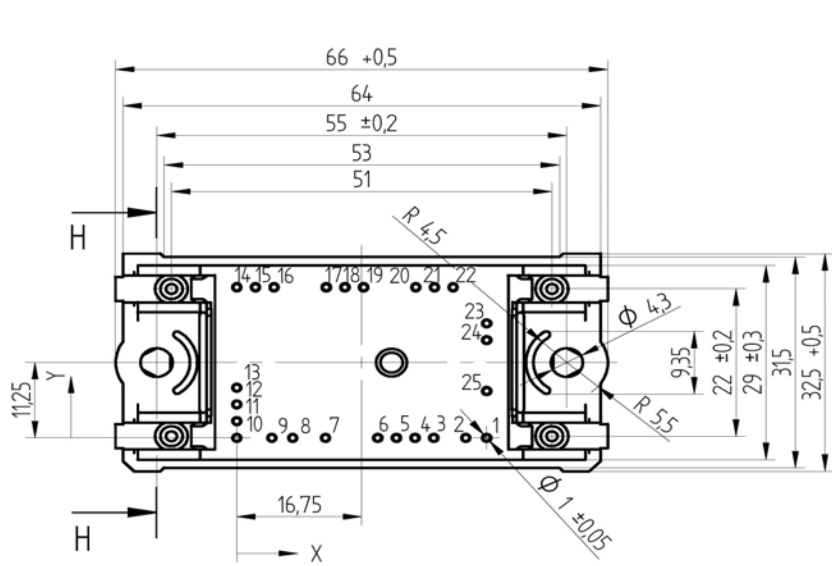
Gate trigger characteristics



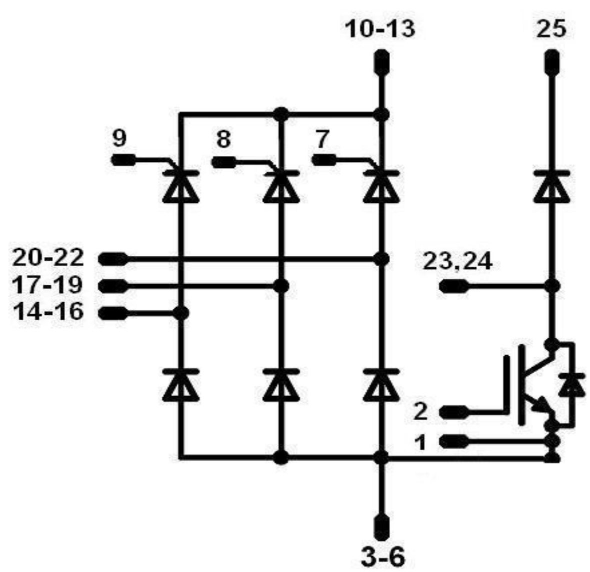
Package Outline and Pinout

Outline

Pin Table		
Pin	X	Y
1	33,5	0
2	30,7	0
3	26,4	0
4	23,9	0
5	21,4	0
6	18,9	0
7	11,9	0
8	7,5	0
9	4,7	0
10	0	0
11	0	2,5
12	0	5
13	0	7,5
14	0	22,5
15	2,5	22,5
16	5	22,5
17	12	22,5
18	14,5	22,5
19	17	22,5
20	24	22,5
21	26,5	22,5
22	29	22,5
23	33,5	17,1
24	33,5	14,6
25	33,5	7



Pinout



PRODUCT STATUS DEFINITIONS

Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data may be published at a later date. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.
Final	Full Production	This datasheet contains final specifications. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.