Vincotech

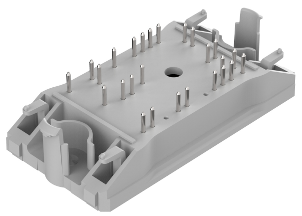
10-FZ062TA030SM-P986D13
datasheet

***flow*PFC 0 CD** **650 V / 30 A**

Features

- High-efficient rectifier
- High-efficient IGBT H5 + Stealth 2 Diode
- Ultra-fast switching speed
- Integrated capacitors
- Thermistor

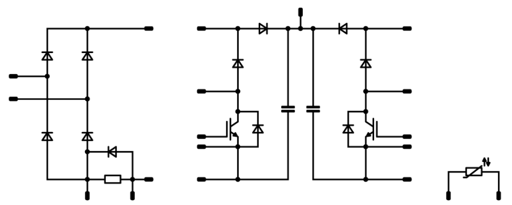
flow 0 12 mm housing



Target applications

- Power Supply
- Welding & Cutting

Schematic



Types

- 10-FZ062TA030SM-P986D13

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
PFC Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	28	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	57	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
PFC Diode					
Peak repetitive reverse voltage	V_{RRM}			600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	33	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 8,3 ms	T_j = 25 °C	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	65	W
Maximum junction temperature	T_{jmax}			175	°C
PFC Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	17	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	33	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Current Transformer Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	17	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	33	W
Maximum junction temperature	T_{jmax}			175	°C
Shunt Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	45	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	280	A
Surge current capability	I^2t			390	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	59	W
Maximum junction temperature	T_{jmax}			150	°C
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	45	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	280	A
Surge current capability	I^2t			390	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	59	W
Maximum junction temperature	T_{jmax}			150	°C
PFC Shunt					
DC current	I		T_c = 70 °C	26	A
Power dissipation	P_{tot}		T_c = 70 °C	7	W

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			1000	V
Operation Temperature	T_{op}			-55 ... 125	°C
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	4000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				>12,7	mm
Clearance				8,99	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
PFC Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0003	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		30	25 125 150		1,7 1,93 2	2,22(1)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		2100		pF
Reverse transfer capacitance	C_{res}							7,7		pF
Gate charge	Q_g	V_{CC} = 520 V	15		30	25		70		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,66		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	0/15	400	30	25 125		25,2 22,8		ns
Rise time	t_r					25 125		9,6 10,8		ns
Turn-off delay time	$t_{d(off)}$					25 125		143,8 159,4		ns
Fall time	t_f					25 125		4,31 7,29		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,269 µC Q_{rFWD}=0,79 µC				25 125		0,445 0,715		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,132 0,225		mWs

Characteristic Values

Parameter	Symbol	Conditions					Values			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	
PFC Diode										
Static										
Forward voltage	V_F				30	25 125	1,88	2,34 2,02	2,78(1)	V
Reverse leakage current	I_R	V_r = 600 V				25 125			10 500	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,46		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=2682 A/µs di/dt=2448 A/µs	0/15	400	30	25 125		18,28 28,4		A
Reverse recovery time	t_{rr}					25 125		16,39 44,65		ns
Recovered charge	Q_r					25 125		0,269 0,79		µC
Reverse recovered energy	E_{rec}					25 125		0,046 0,1		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		4655 1857		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Values			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	
PFC Sw. Protection Diode										
Static										
Forward voltage	V_F				10	25 125	1,23	1,67 1,56	1,87[1]	V
Reverse leakage current	I_R	V_r = 650 V				25			0,14	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,87		K/W
Current Transformer Protection Diode										
Static										
Forward voltage	V_F				10	25 125	1,23	1,67 1,56	1,87[1]	V
Reverse leakage current	I_R	V_r = 650 V				25			0,14	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,87		K/W
Shunt Protection Diode										
Static										
Forward voltage	V_F				50	25 125		1,32 1,33	1,3[1] 1,33[1]	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			20 1500	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,2		K/W

Characteristic Values

Parameter	**Symbol**	**Conditions**					**Values**			**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 Diode										
Static										
Forward voltage	V_F				50	25 125		1,32 1,33	1,3[1] 1,33[1]	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			20 1500	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,2		K/W
PFC Shunt										
Static										
Resistance	R							10		mΩ
Tolerance							-1		1	%
Temperature coeficient	tc							50		ppm/K
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		100		nF
Tolerance							10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%

Characteristic Values

Parameter	Symbol	Conditions					Values			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	
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P							5		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %						4000		K
Vincotech Thermistor Reference									I	

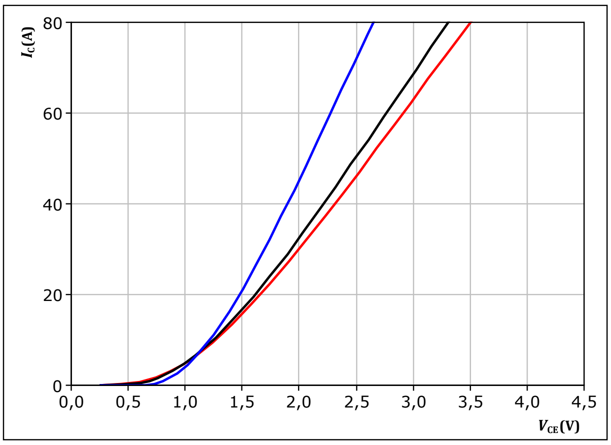
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

PFC Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

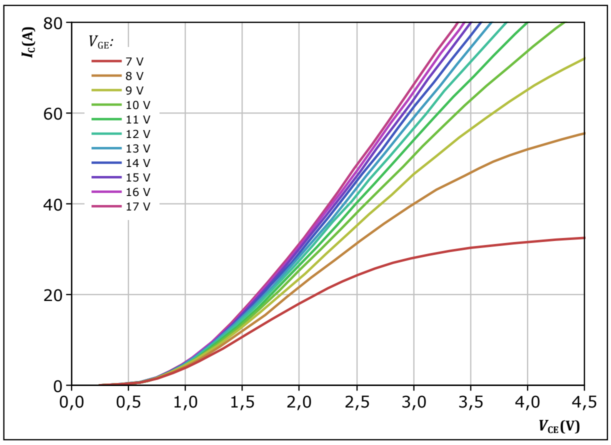


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



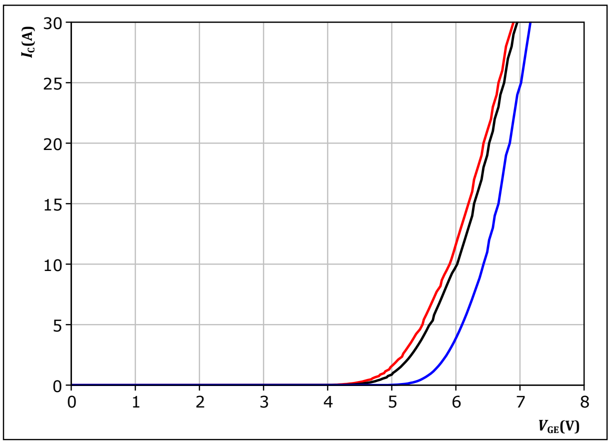
t_p =	250	µs
T_j =	150	°C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

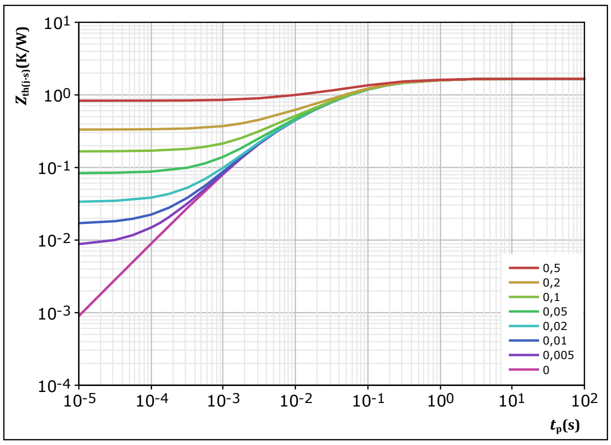


t_p =	250	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,665 K/W

IGBT thermal model values

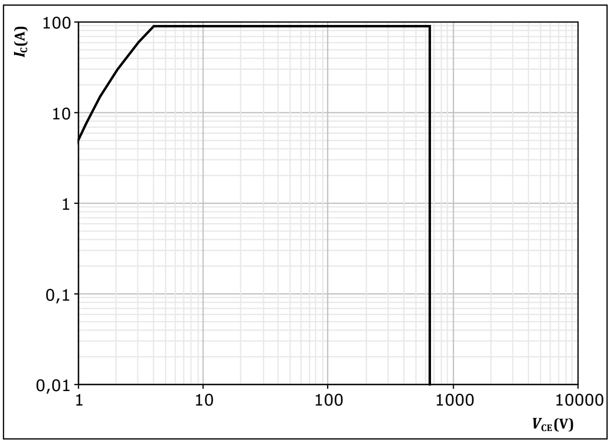
R (K/W)	τ (s)
1,80E-01	1,06E+00
3,72E-01	1,72E-01
6,39E-01	5,52E-02
3,20E-01	1,27E-02
1,54E-01	3,03E-03

PFC Switch Characteristics

figure 5.	IGBT

Safe operating area

I_C = f(V_{CE})



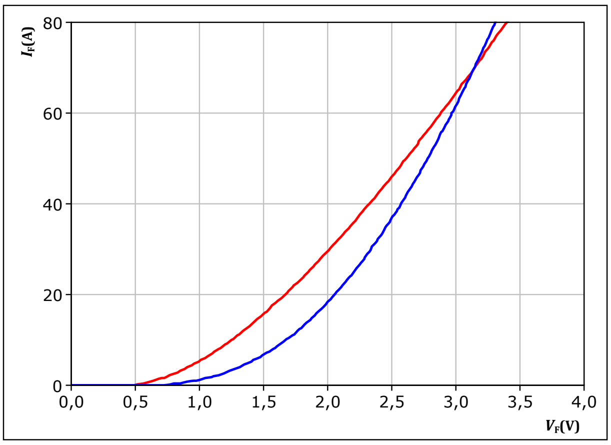
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

PFC Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



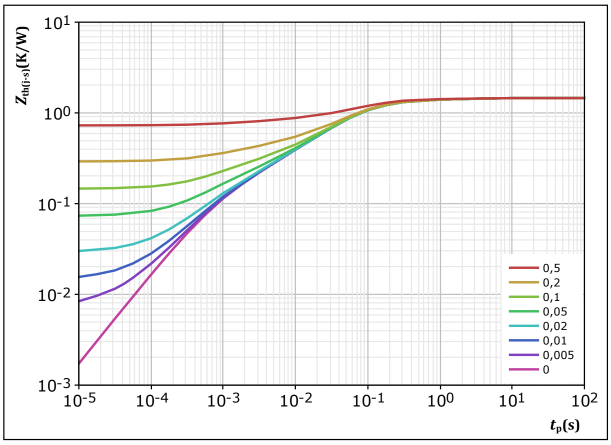
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,456 K/W

FWD thermal model values

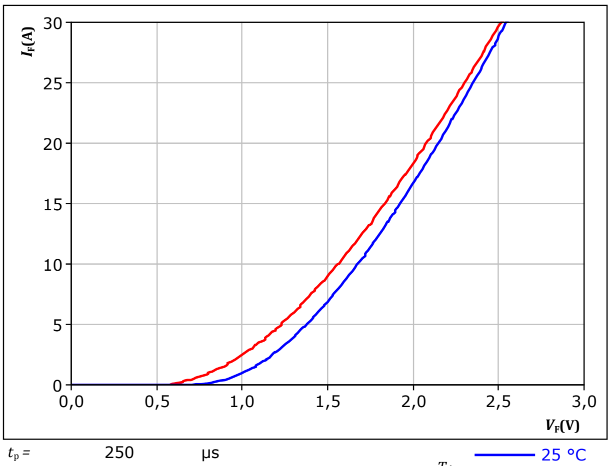
R (K/W)	τ (s)
6,84E-02	2,71E+00
1,85E-01	3,24E-01
7,77E-01	6,88E-02
2,30E-01	1,94E-02
1,15E-01	3,46E-03
8,19E-02	7,02E-04

PFC Sw. Protection Diode Characteristics

figure 8. **FWD**

Typical forward characteristics

I_F = f(V_F)



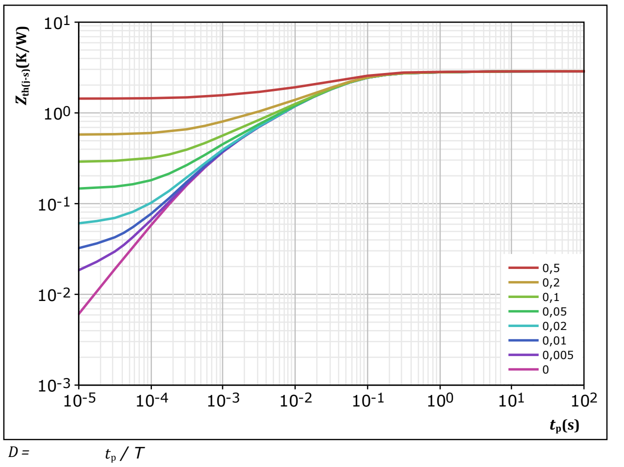
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 9. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,873 K/W

FWD thermal model values

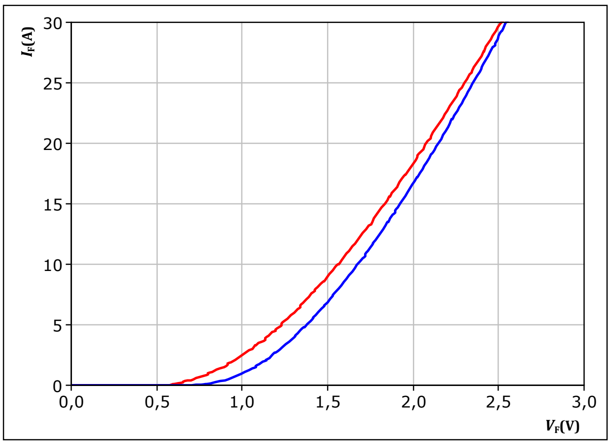
R (K/W)	τ (s)
6,53E-02	3,94E+00
1,48E-01	4,48E-01
1,31E+00	5,96E-02
7,32E-01	1,36E-02
4,04E-01	2,79E-03
2,11E-01	5,37E-04

Current Transformer Protection Diode Characteristics

figure 10. FWD

Typical forward characteristics

$I_F = f(V_F)$



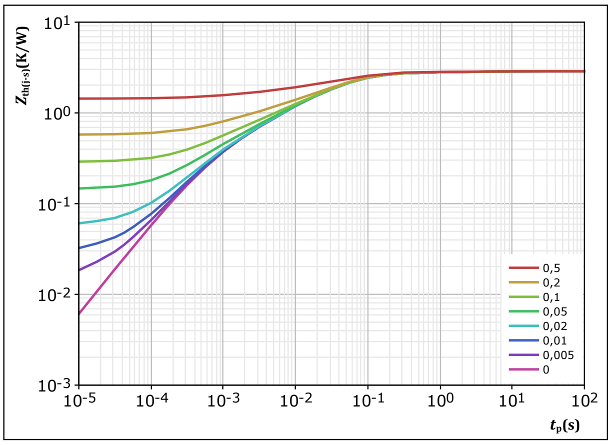
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 11. FWD

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,873 K/W

FWD thermal model values

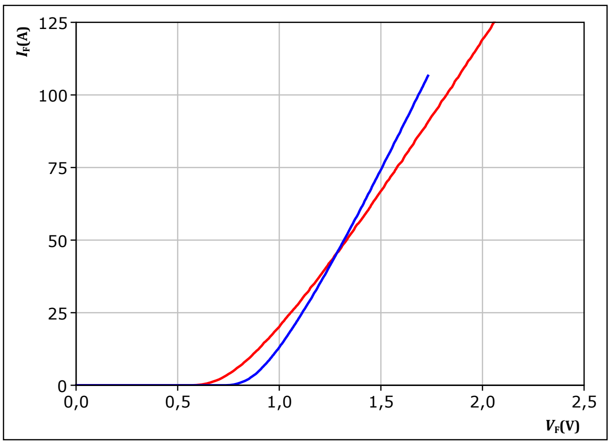
R (K/W)	τ (s)
6,53E-02	3,94E+00
1,48E-01	4,48E-01
1,31E+00	5,96E-02
7,32E-01	1,36E-02
4,04E-01	2,79E-03
2,11E-01	5,37E-04

Shunt Protection Diode Characteristics

figure 12. **Rectifier**

Typical forward characteristics

I_F = f(V_F)



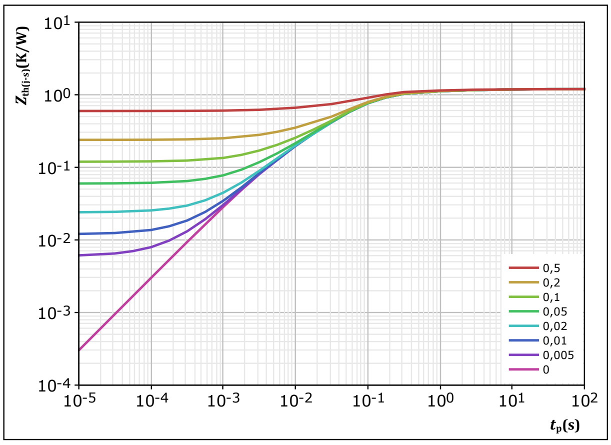
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 13. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,195 K/W

Rectifier thermal model values

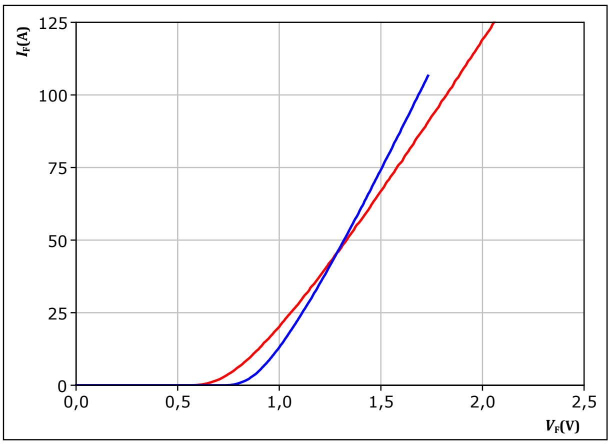
R (K/W)	τ (s)
4,87E-02	6,80E+00
1,57E-01	6,29E-01
7,33E-01	9,05E-02
1,69E-01	3,10E-02
7,37E-02	4,76E-03
1,39E-02	1,53E-02

Rectifier Diode Characteristics

figure 14.	Rectifier

Typical forward characteristics

I_F = f(V_F)



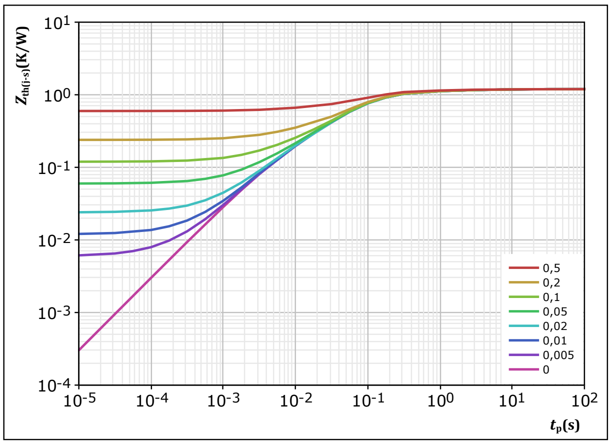
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 15.	Rectifier

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,195 K/W

Rectifier thermal model values

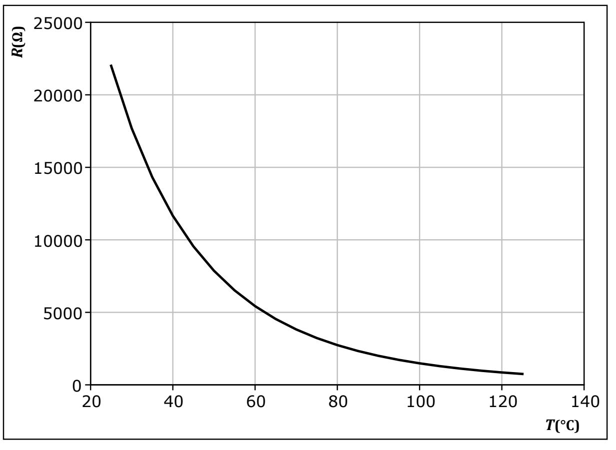
R (K/W)	τ (s)
4,87E-02	6,80E+00
1,57E-01	6,29E-01
7,33E-01	9,05E-02
1,69E-01	3,10E-02
7,37E-02	4,76E-03
1,39E-02	1,53E-02

Thermistor Characteristics

figure 16.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

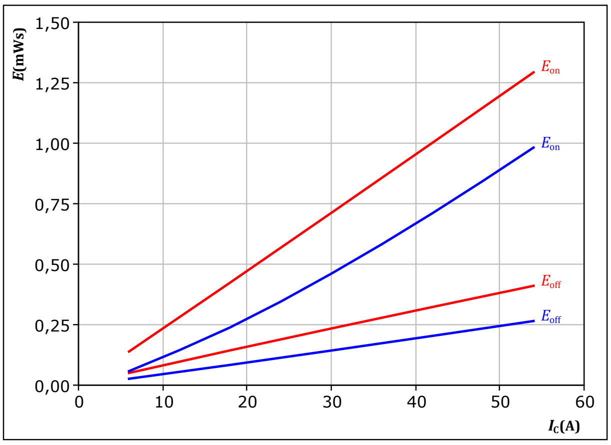


PFC Switching Characteristics

figure 17. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

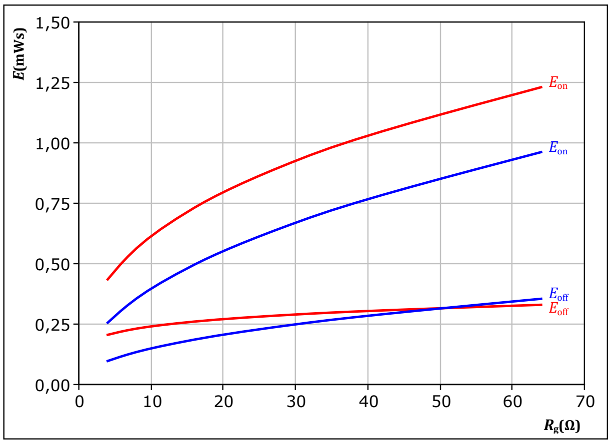
T_j: 25 °C / 125 °C

V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 18. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



With an inductive load at

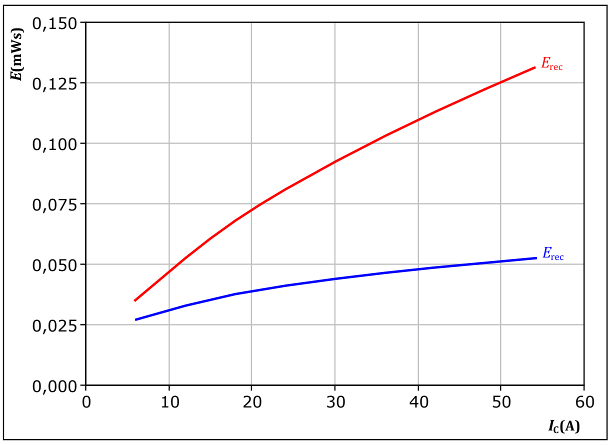
T_j: 25 °C / 125 °C

V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	30	A

figure 19. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

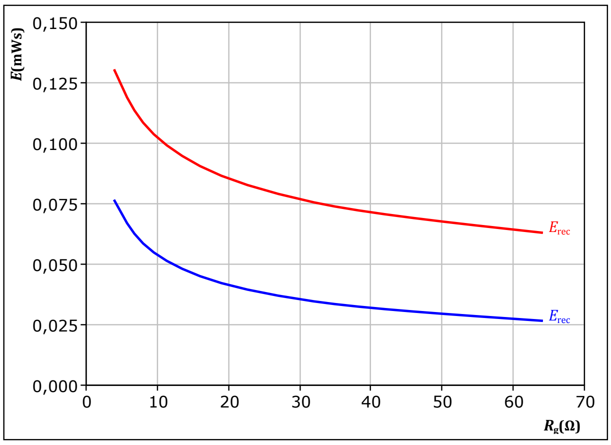
T_j: 25 °C / 125 °C

V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	16	Ω

figure 20. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

T_j: 25 °C / 125 °C

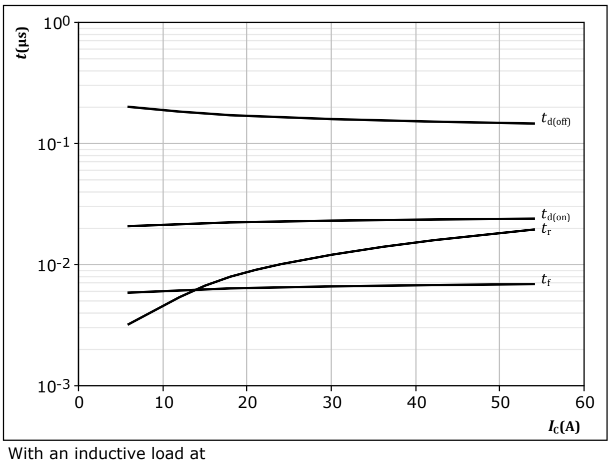
V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	30	A

PFC Switching Characteristics

figure 21. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



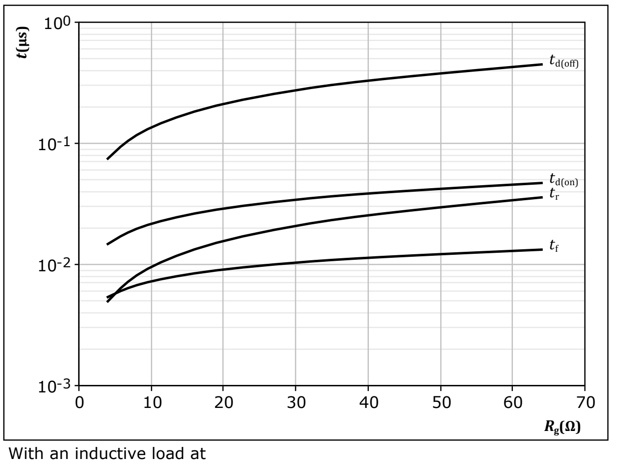
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 22. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



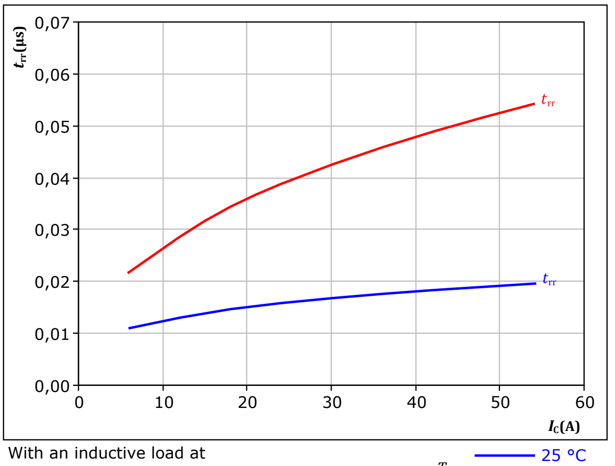
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	30	A

figure 23. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

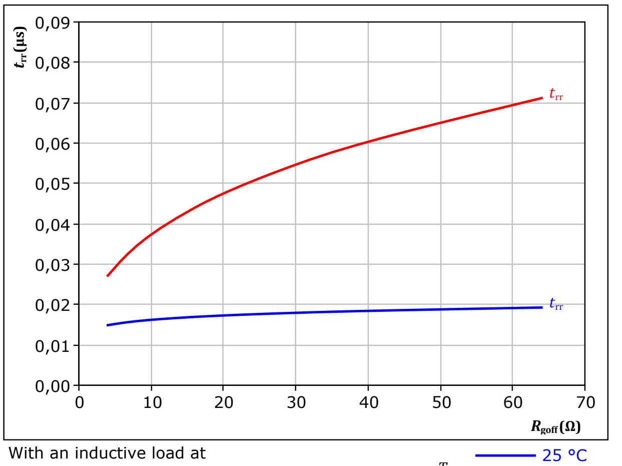
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	16	Ω

T_j: 25 °C / 125 °C

figure 24. **FWD**

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

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



With an inductive load at

V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	30	A

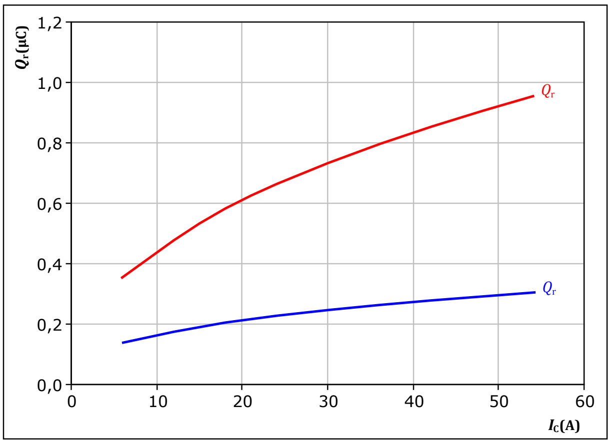
T_j: 25 °C / 125 °C

PFC Switching Characteristics

figure 25. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



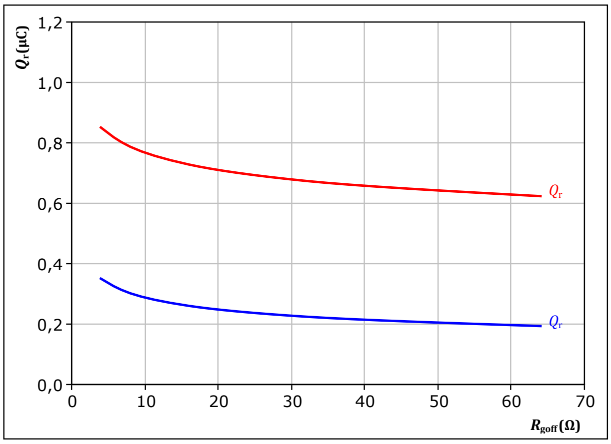
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
R_{gon} =	16	Ω	

figure 26. FWD

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



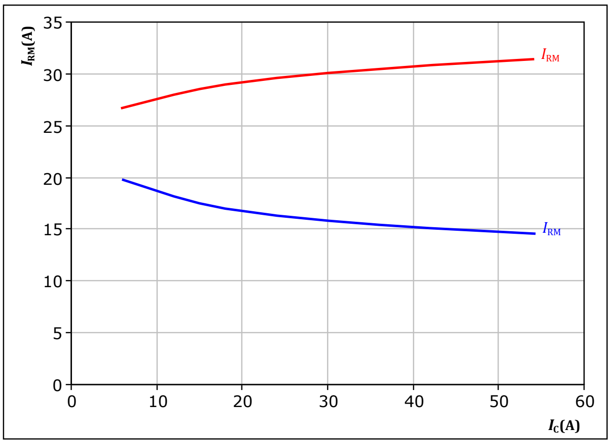
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
I_C =	30	A	

figure 27. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



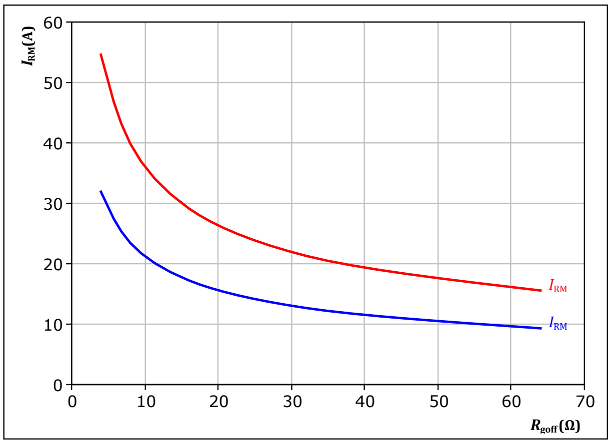
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
R_{gon} =	16	Ω	

figure 28. FWD

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

I_{RM} = f(R_{goff})



With an inductive load at

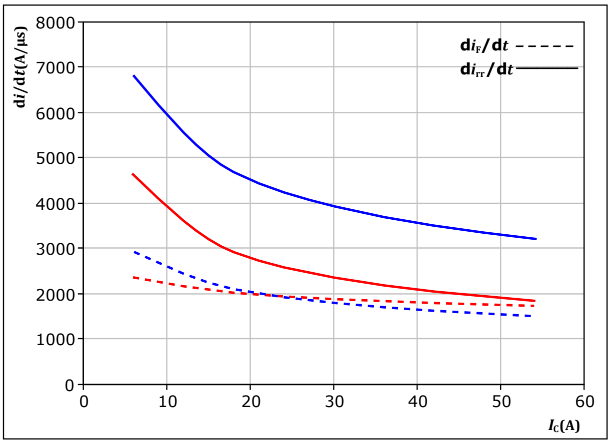
V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
I_C =	30	A	

PFC Switching Characteristics

figure 29. **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)



With an inductive load at

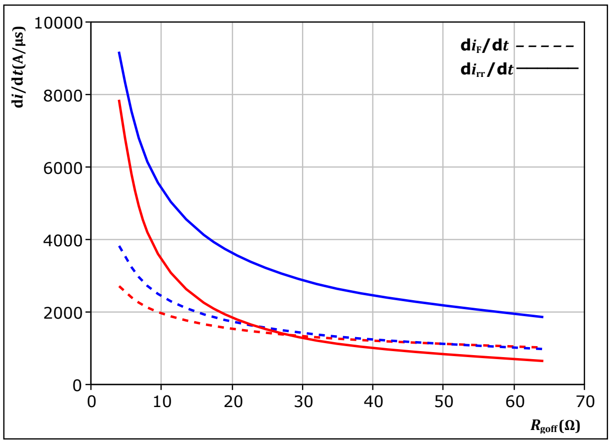
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	16	Ω

T_j: 25 °C, 125 °C

figure 30. **FWD**

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

di_F/dt, di_{rr}/dt = f(R_{goff})



With an inductive load at

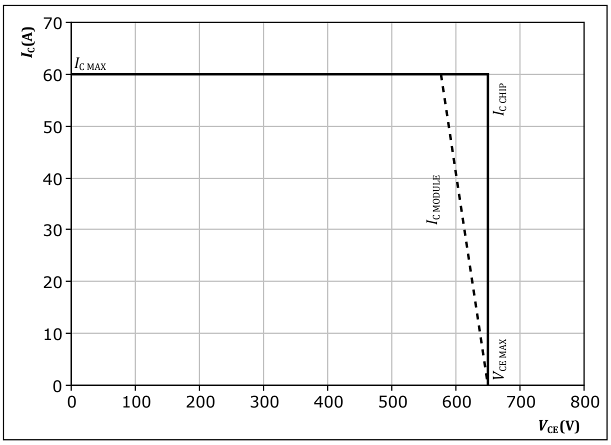
V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	30	A

T_j: 25 °C, 125 °C

figure 31. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At			
	T_j =	125	°C
	R_{gon} =	16	Ω
	R_{goff} =	16	Ω

PFC Switching Definitions

figure 32. **IGBT**

Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{tEoff} = **integrating time for** E_{off})

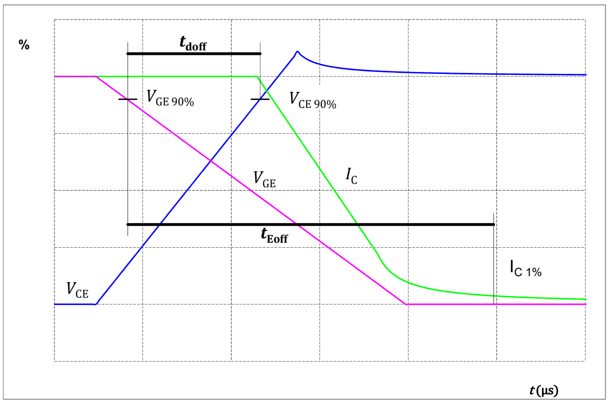


figure 33. **IGBT**

Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = **integrating time for** E_{on})

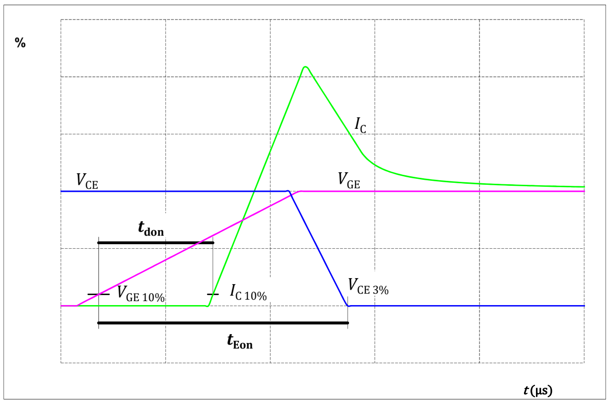


figure 34. **IGBT**

Turn-off Switching Waveforms & definition of t_f

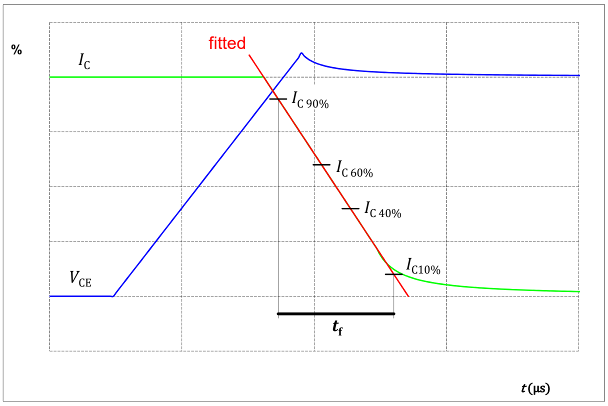
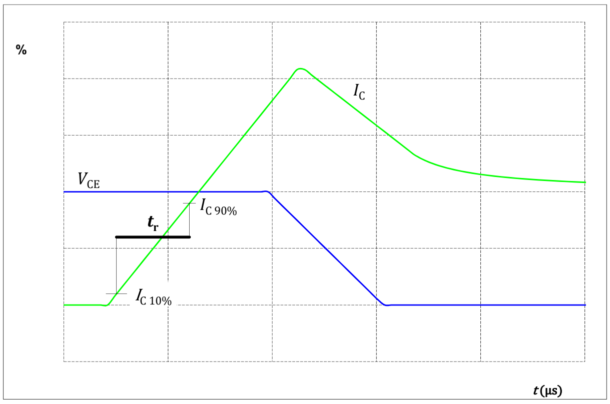


figure 35. **IGBT**

Turn-on Switching Waveforms & definition of t_r



PFC Switching Definitions

figure 36. **FWD**

Turn-off Switching Waveforms & definition of t_{rr}

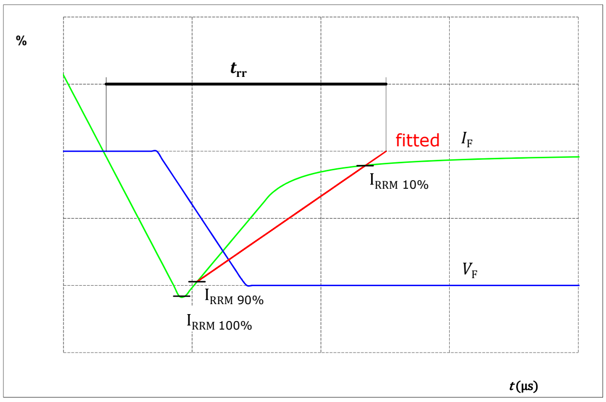
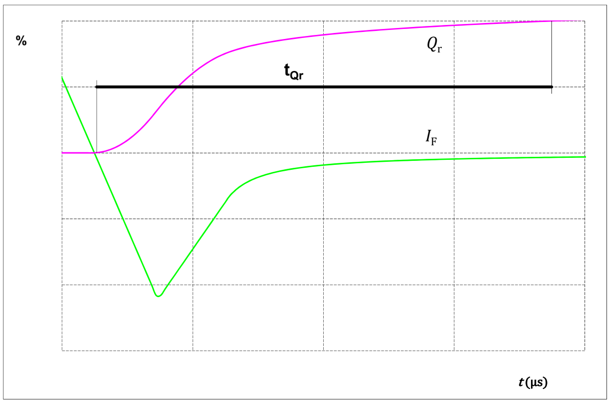


figure 37. **FWD**

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



Vincotech

Ordering Code

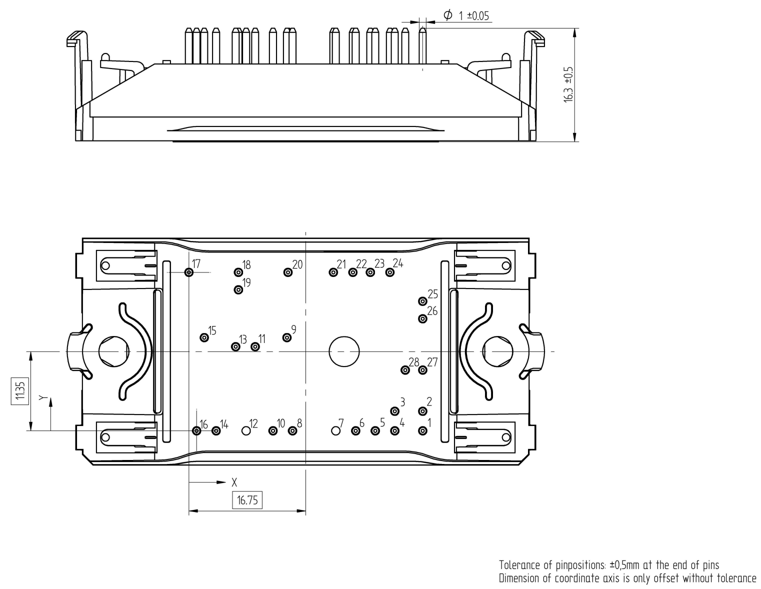
Version	Ordering Code
Without thermal paste	10-FZ062TA030SM-P986D13
With thermal paste (5,2 W/mK, PTM6000HV)	10-FZ062TA030SM-P986D13-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FZ062TA030SM-P986D13-/3/

Marking

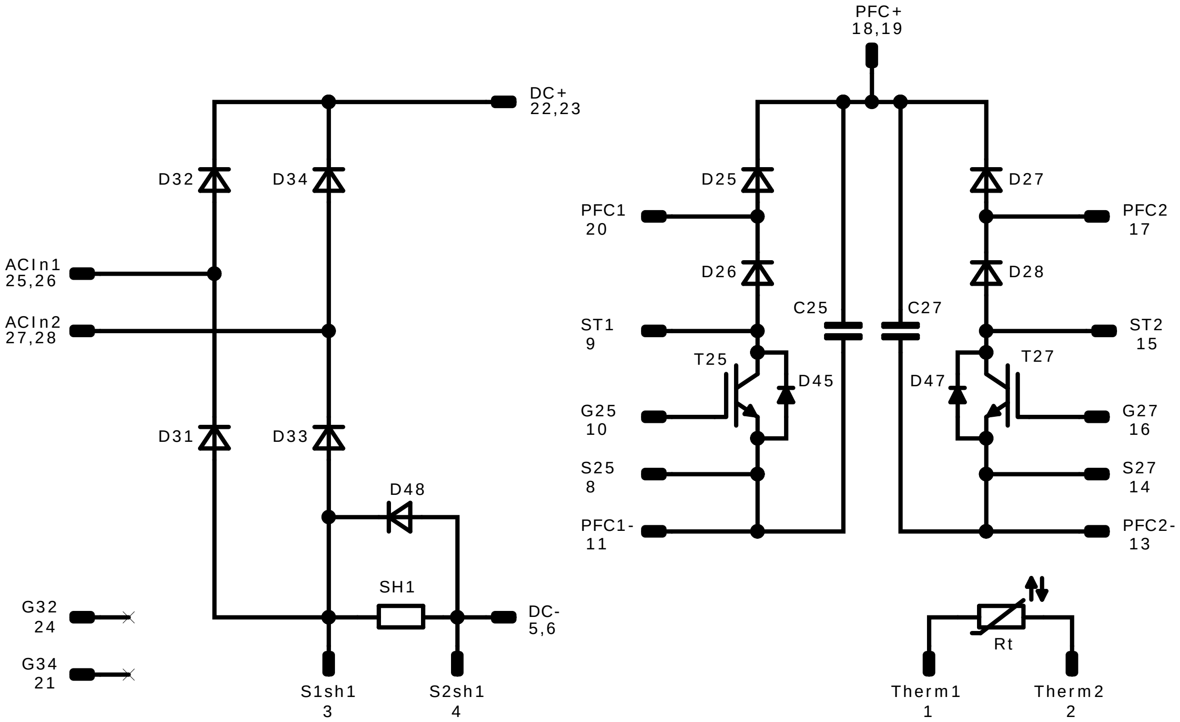
	**Text**	**Name**	**Date code**	**UL & VIN**	**Lot**	**Serial**
		NN-NNNNNNNNNNNNNN-TTTTTTVV	WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**	
		TTTTTTTVV	LLLLL	SSSS	WWYY	

Outline

Pin table [mm]			
Pin	X	Y	Function
1	33,5	0	Therm1
2	33,5	2,8	Therm2
3	29,5	2,8	S1sh1
4	29,5	0	S2sh1
5	26,7	0	DC-
6	23,9	0	DC-
7	not assembled		
8	14,85	0	S25
9	14,05	13,35	ST1
10	12,05	0	G25
11	9,5	12,05	PFC1-
12	not assembled		
13	6,7	12,05	PFC2-
14	3,9	0	S27
15	2,2	13,35	ST2
16	1,1	0	G27
17	0	22,7	PFC2
18	7,1	22,7	PFC+
19	7,1	20,2	PFC+
20	14,2	22,7	PFC1
21	20,7	22,7	G34
22	23,5	22,7	DC+
23	26	22,7	DC+
24	28,8	22,7	G32
25	33,5	18,55	ACIn1
26	33,5	16,05	ACIn1
27	33,5	8,7	ACIn2
28	31	8,7	ACIn2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T25, T27	IGBT	650 V	30 A	PFC Switch	
D25, D27	FWD	600 V	30 A	PFC Diode	
D45, D47	FWD	650 V	10 A	PFC Sw. Protection Diode	
D26, D28	FWD	650 V	10 A	Current Transformer Protection Diode	
D48	Rectifier	1600 V	50 A	Shunt Protection Diode	
D31, D32, D33, D34	Rectifier	1600 V	50 A	Rectifier Diode	
SH1	Shunt			PFC Shunt	
C25, C27	Capacitor	1000 V		Capacitor (DC)	
Rt	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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
10-FZ062TA030SM-P986D13-D2-14	12 Sep. 2021	New Datasheet format, module is unchanged Correct tau values of Shunt Protection Diode and Rectifier Diode thermal characteristics	