Vincotech

10-FZ062TA080P7-P980D78

datasheet

***flow*PFC 0** **600 V / 20 A**

Topology features

- Dual Boost PFC
- Half Controlled Converter
- Integrated Shunt Resistor
- Integrated DC capacitor
- Temperature sensor

Component features

- Commutation rugged
- Easy to use / drive
- Suitable for hard and soft switching

Housing features

- Base isolation: Al_2O_3
- Clip-in, reliable mechanical connection, qualified for wave soldering
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Solder pin

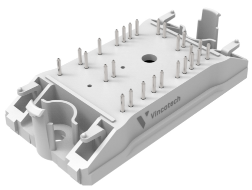
Target applications

- Embedded Drives
- Industrial Drives

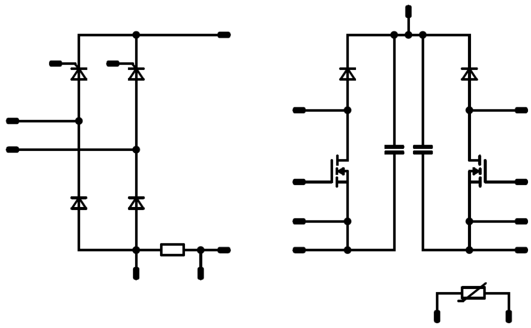
Types

- 10-FZ062TA080P7-P980D78

flow 0 12 mm housing



Schematic



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Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
PFC Switch					
Drain-source voltage	V_{DSS}			600	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$	T_s = 80 °C	18	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		110	A
Avalanche energy, single pulse	E_{AS}	V_{DD} = 50 V	I_D = 5,5 A	118	mJ
Avalanche energy, repetitive	E_{AR}	V_{DD} = 50 V	I_D = 5,5 A	0,58	mJ
MOSFET dv/dt ruggedness	dv/dt	V_{DS}= 0..400 V	T_s = 25 °C	80	V/ns
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	54	W
Gate-source voltage	V_{GSS}			±20	V
Reverse diode dv/dt	dv/dt			50	V/ns
Maximum Junction Temperature	T_{jmax}			150	°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	15	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		46	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 25 °C	90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	35	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Rectifier Thyristor					
Repetitive peak reverse voltage	V_{RRM}			1200	V
Maximum RMS on-state current	I_{TRMSM}	$T_j = T_{jmax}$	T_s = 80 °C	25	A
Surge on-state current	I_{TSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 125 °C	320	A
I2t value	I^2t	Single Half Sine Wave, t_p = 8,3 ms	T_j = 125 °C	510	A^2s
Mean total power loss	$P_{tot}(AV)$	$T_j = T_{jmax}$	T_s = 80 °C	60	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	51	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	68	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
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			500	V
Operation Temperature	T_{op}			-55 ... 125	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		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	6000	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					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 Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		10		11,8	25 125		81 148	80(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,00059	25	3	3,5	4	V
Gate to Source Leakage Current	I_{GSS}		20	0		25			100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	600		25			1	µA
Internal gate resistance	r_g							4,8		Ω
Gate charge	Q_g		0/10	400	11,8	25		51		nC
Short-circuit input capacitance	C_{iss}	f = 250 kHz	0	400	0	25		2180		pF
Short-circuit output capacitance	C_{oss}							37		
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,3		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	0/10	400	10	25 125		14,01 13,88		ns
Rise time	t_r					25 125		2,47 2,95		ns
Turn-off delay time	$t_{d(off)}$					25 125		61,56 69,03		ns
Fall time	t_f					25 125		3,13 5,66		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,063 µC Q_{rFWD}=0,068 µC				25 125		0,017 0,022		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,015 0,018		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				10	25 125 150		1,49 1,69 1,78	1,8(1)	V
Reverse leakage current	I_R	V_r = 600 V				25 150		10 20	50 200	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,75		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=4533 A/µs d*i*/d*t*=4171 A/µs	0/10	400	10	25 125		16,14 14,34		A
Reverse recovery time	t_{rr}					25 125		7 8,33		ns
Recovered charge	Q_r					25 125		0,063 0,068		µC
Reverse recovered energy	E_{rec}					25 125		0,022 0,022		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		6253,58 3151,81		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	
Rectifier Thyristor										
Static										
On-state voltage	V_T				44	25 125		1,39 1,41	1,33 1,32	V
On-state threshold voltage	$V_{T(TO)}$				44	125			0,9	V
On-state slope resistance	r_T				44	125			9	mΩ
Direct reverse current	I_{RD}	V_r = 1200 V				25 125			10 2	µA
Holding current	I_H			6		25			50	mA
Latching current	I_L	t_p = 10 µs I_G = 0,2 A di_G/dt = A/µs				25			90	mA
Gate trigger voltage	V_{GT}					25			10	V
Gate trigger current	I_{GT}			6		25	11		28	mA
Gate non-trigger voltage	V_{GD}			2/3 V_{DRM}		125			0,2	V
Gate non-trigger current	I_{GD}					25			1	mA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,16		K/W
Rectifier Diode										
Static										
Forward voltage	V_F				50	25 125		1,31 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)						1,03		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	
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		270		nF
Tolerance							-20		20	%
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					25		130		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	

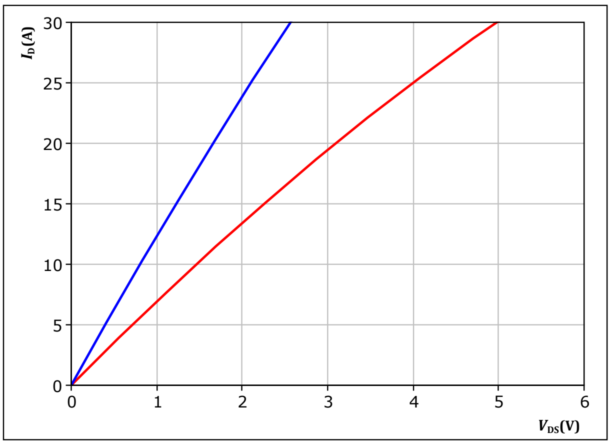
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

PFC Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



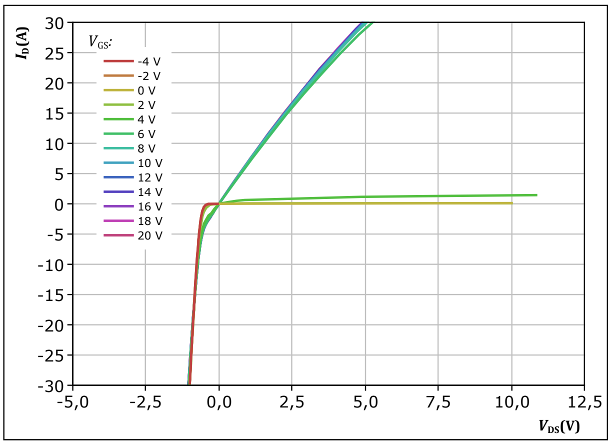
t_p =	250	µs
V_{GS} =	10	V

T_j: 25 °C / 125 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



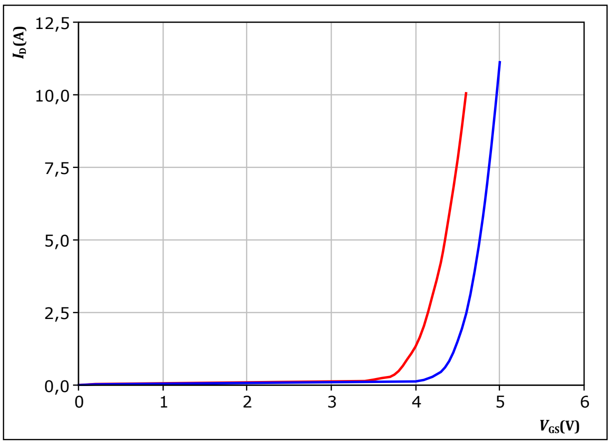
t_p =	250	µs
T_j =	125	°C

V_{GS} from -4 V to 20 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$



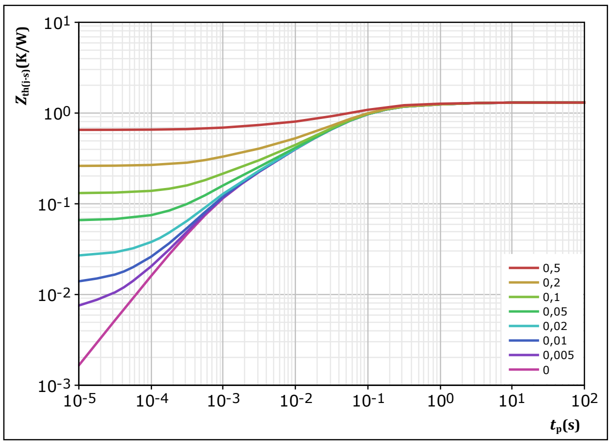
t_p =	250	µs
V_{DS} =	10	V

T_j: 25 °C / 125 °C

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,305	K/W

MOSFET thermal model values

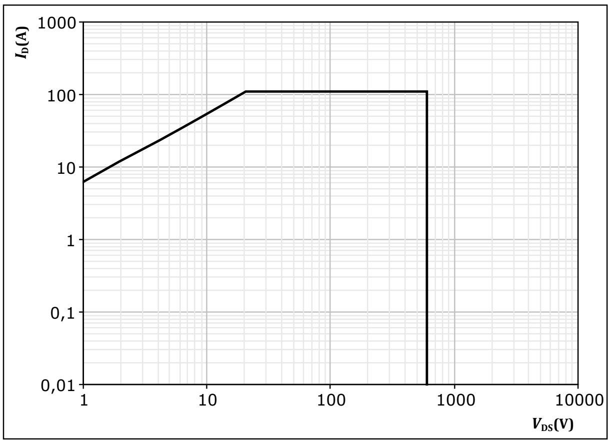
R (K/W)	τ (s)
9,84E-02	1,89E+00
3,74E-01	1,49E-01
4,96E-01	4,32E-02
2,23E-01	8,00E-03
1,14E-01	9,13E-04

PFC Switch Characteristics

figure 5.	**MOSFET**

Safe operating area

I_D = f(V_{DS})



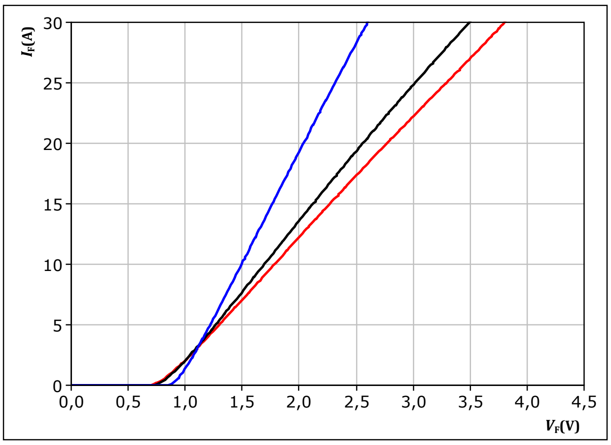
D =	single pulse	
T_s =	80	°C
V_{GS} =	10	V
T_j =	T_{jmax}	

PFC Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

I_F = f(V_F)



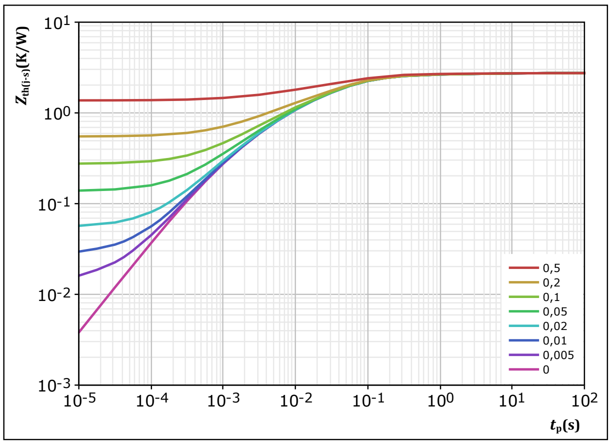
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,746 K/W

FWD thermal model values

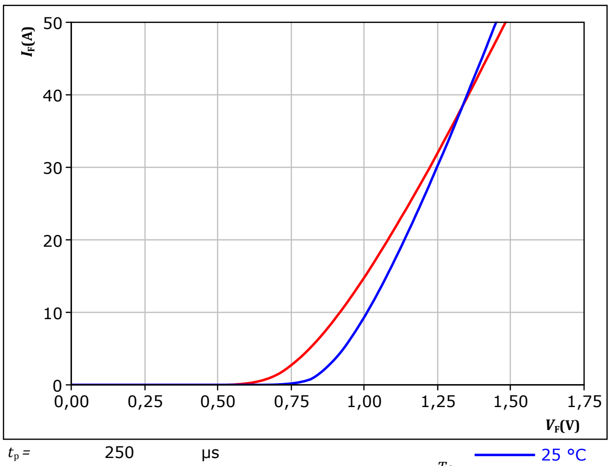
R (K/W)	τ (s)
7,62E-02	8,00E+00
2,31E-01	4,59E-01
1,19E+00	6,16E-02
6,92E-01	1,36E-02
4,41E-01	3,29E-03
1,19E-01	6,68E-04

Rectifier Thyristor Characteristics

figure 8. **Thyristor**

Typical forward characteristics

I_F = f(V_F)



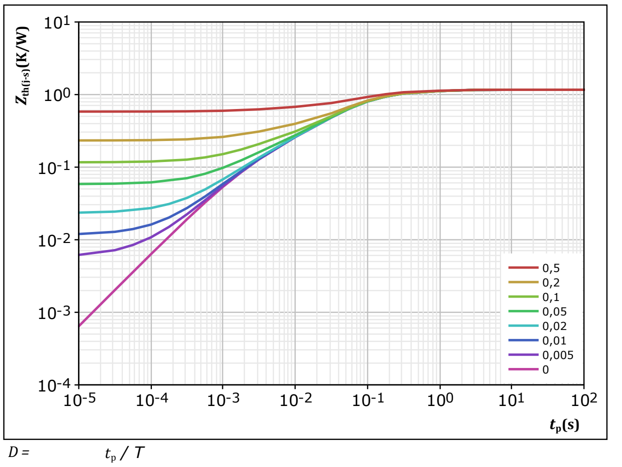
t_p = 250 μs

T_j: 25 °C, 125 °C

figure 9. **Thyristor**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,165 K/W

Thyristor thermal model values

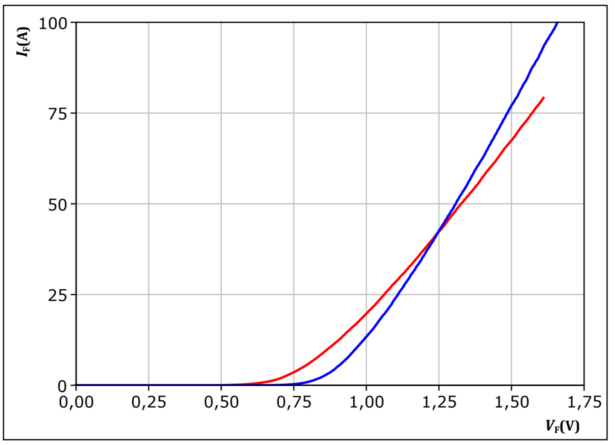
R (K/W)	τ (s)
1,32E-01	9,48E-01
4,51E-01	1,25E-01
4,32E-01	4,22E-02
1,06E-01	5,61E-03
4,49E-02	1,42E-03

Rectifier Diode Characteristics

figure 10. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



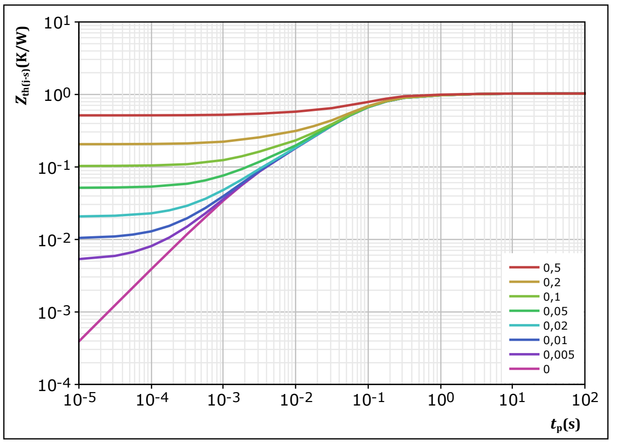
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 11. **Rectifier**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,03 K/W

Rectifier thermal model values

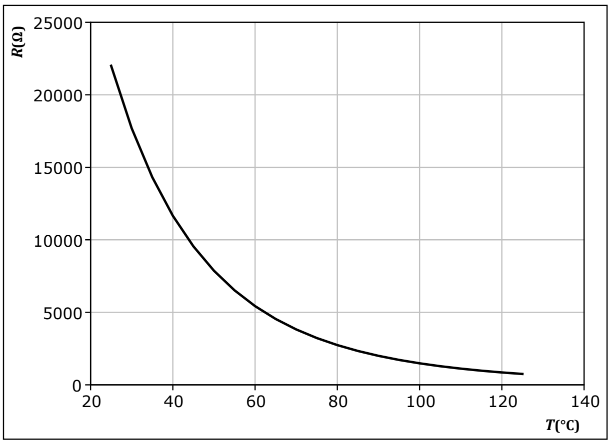
R (K/W)	τ (s)
5,79E-02	2,65E+00
1,32E-01	4,48E-01
6,73E-01	8,28E-02
1,09E-01	1,86E-02
5,86E-02	2,34E-03

Thermistor Characteristics

figure 12.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

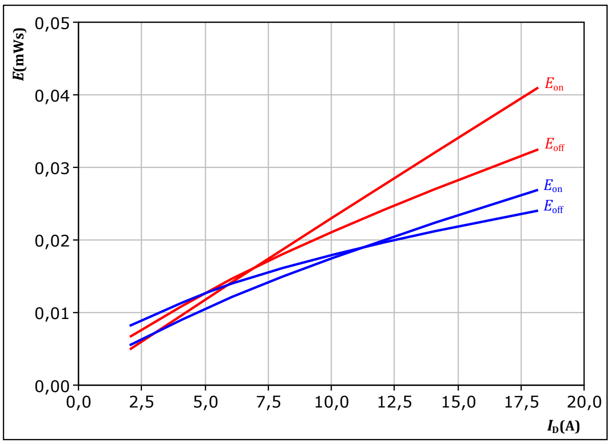


PFC Switching Characteristics

figure 13. **MOSFET**

Typical switching energy losses as a function of drain current

E = f(I_D)



With an inductive load at

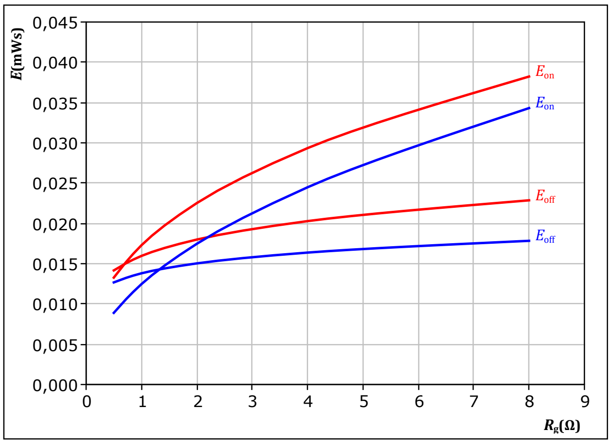
V_{DS} =	400	V	
V_{GS} =	0/10	V	
R_{gon} =	2	Ω	
R_{goff} =	2	Ω	

T_j: 25 °C, 125 °C

figure 14. **MOSFET**

Typical switching energy losses as a function of MOSFET turn on gate resistor

E = f(R_g)



With an inductive load at

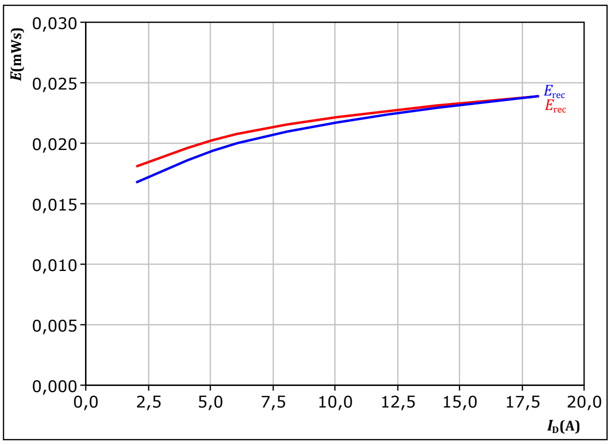
V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	10	A

T_j: 25 °C, 125 °C

figure 15. **FWD**

Typical reverse recovered energy loss as a function of drain current

E_{rec} = f(I_D)



With an inductive load at

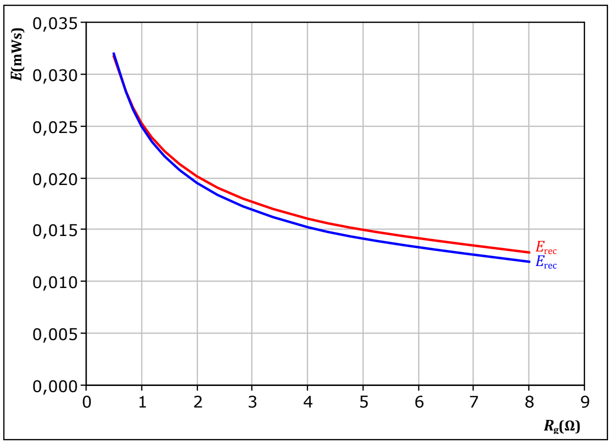
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C

figure 16. **FWD**

Typical reverse recovered energy loss as a function of MOSFET turn on gate resistor

E_{rec} = f(R_g)



With an inductive load at

V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	10	A

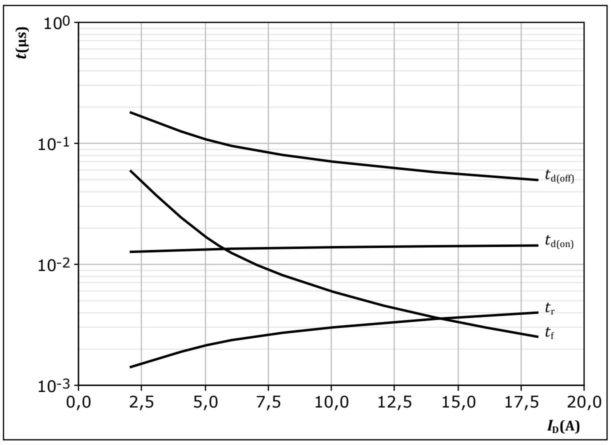
T_j: 25 °C, 125 °C

PFC Switching Characteristics

figure 17. MOSFET

Typical switching times as a function of drain current

t = f(I_D)



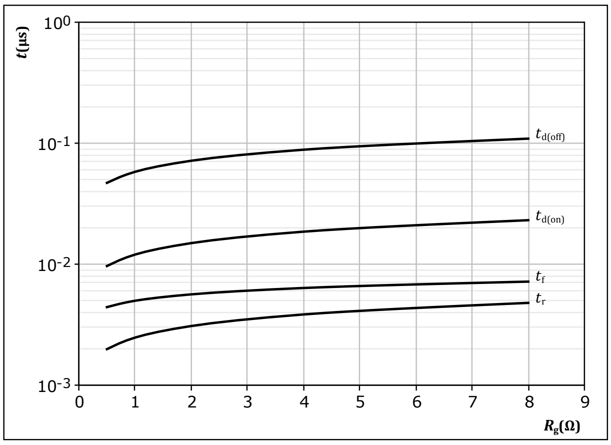
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 18. MOSFET

Typical switching times as a function of MOSFET turn on gate resistor

t = f(R_g)



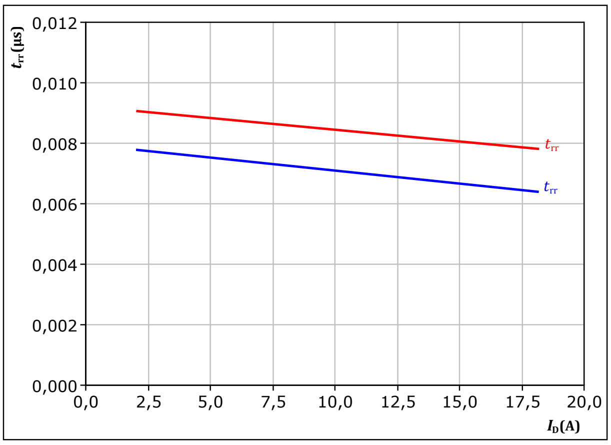
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	10	A

figure 19. FWD

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



At

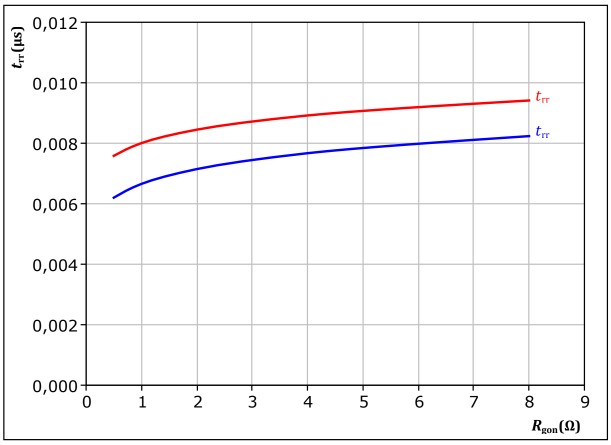
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C

figure 20. FWD

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

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



At

V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	10	A

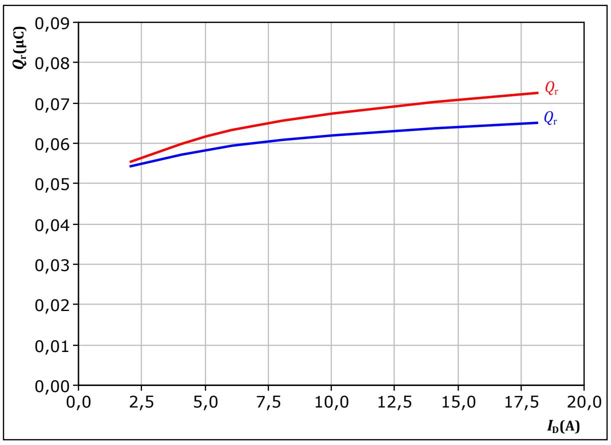
T_j: 25 °C, 125 °C

PFC Switching Characteristics

figure 21. **FWD**

Typical recovered charge as a function of drain current

Q_r = f(I_D)

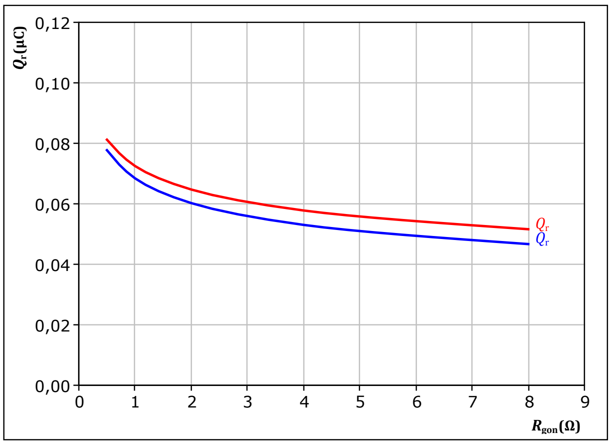


At				
V_{DS} =	400	V	T_j:	25 °C
V_{GS} =	0/10	V		125 °C
R_{gon} =	2	Ω		

figure 22. **FWD**

Typical recovered charge as a function of MOSFET turn on gate resistor

Q_r = f(R_{gon})

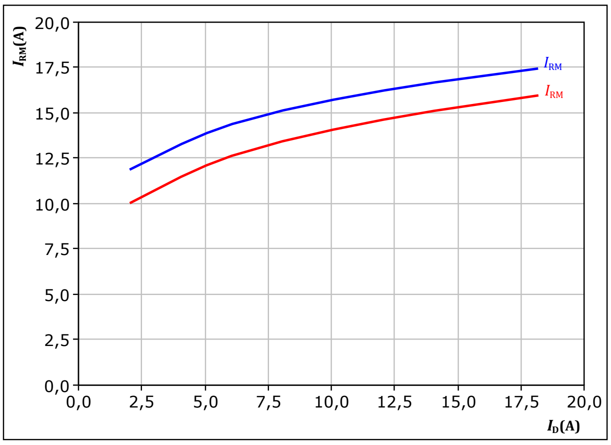


At				
V_{DS} =	400	V	T_j:	25 °C
V_{GS} =	0/10	V		125 °C
I_D =	10	A		

figure 23. **FWD**

Typical peak reverse recovery current as a function of drain current

I_{RM} = f(I_D)

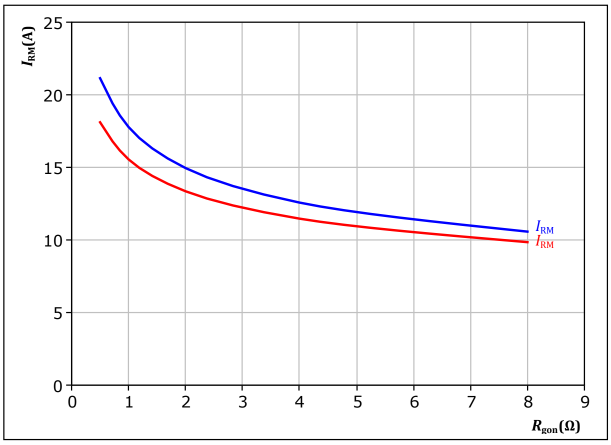


At				
V_{DS} =	400	V	T_j:	25 °C
V_{GS} =	0/10	V		125 °C
R_{gon} =	2	Ω		

figure 24. **FWD**

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

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



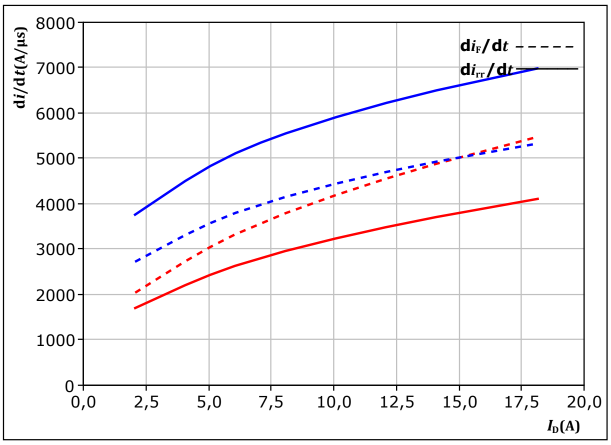
At				
V_{DS} =	400	V	T_j:	25 °C
V_{GS} =	0/10	V		125 °C
I_D =	10	A		

PFC Switching Characteristics

figure 25. **FWD**

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

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

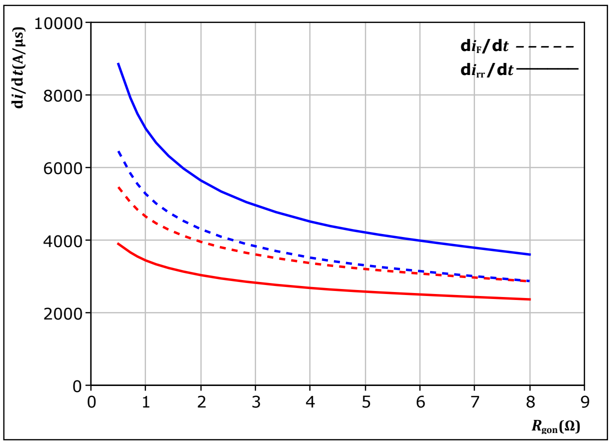


At				T_j:	
	V_{DS} =	400	V		25 °C
	V_{GS} =	0/10	V		125 °C
	R_{gon} =	2	Ω		

figure 26. **FWD**

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

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

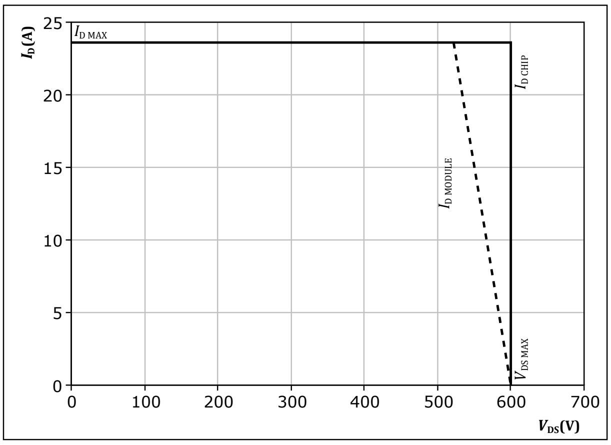


At				T_j:	
	V_{DS} =	400	V		25 °C
	V_{GS} =	0/10	V		125 °C
	I_D =	10	A		

figure 27. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At			
	T_j =	125	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

PFC Switching Definitions

figure 28. **MOSFET**

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

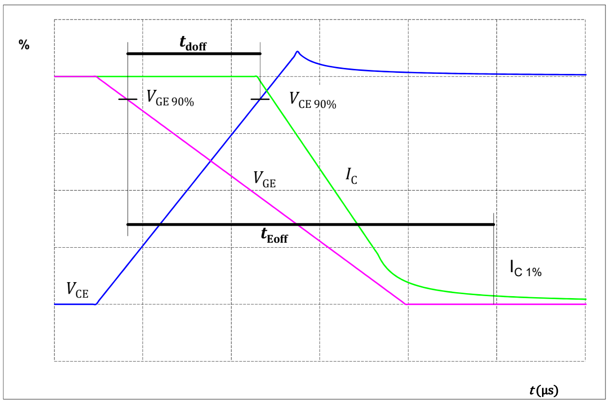


figure 29. **MOSFET**

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

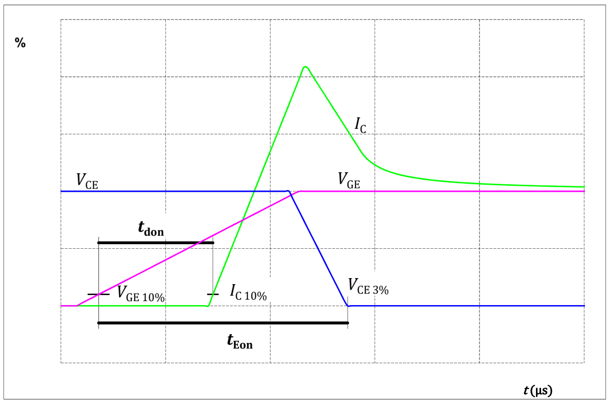


figure 30. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

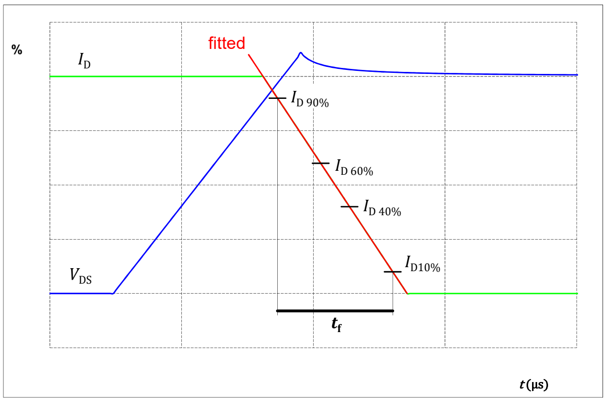
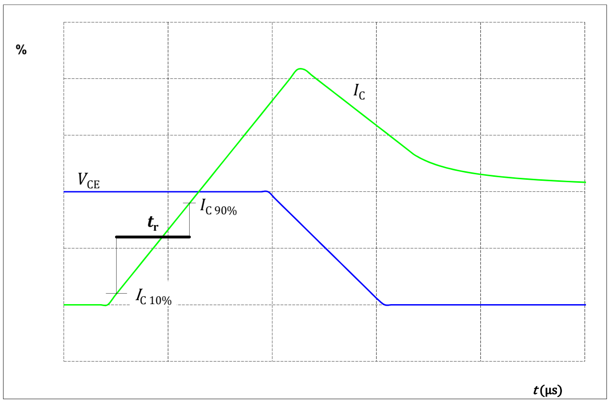


figure 31. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



PFC Switching Definitions

figure 32.	FWD

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

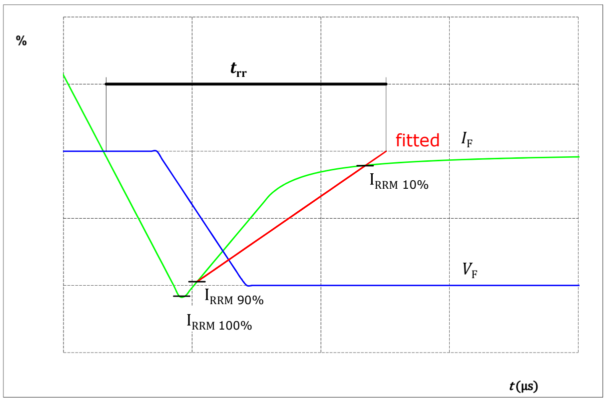


figure 33.	FWD

Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})

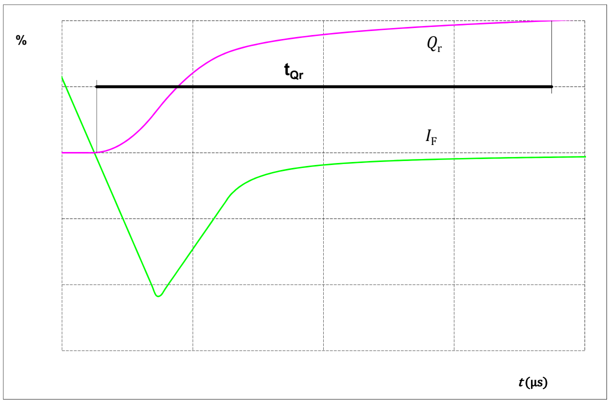
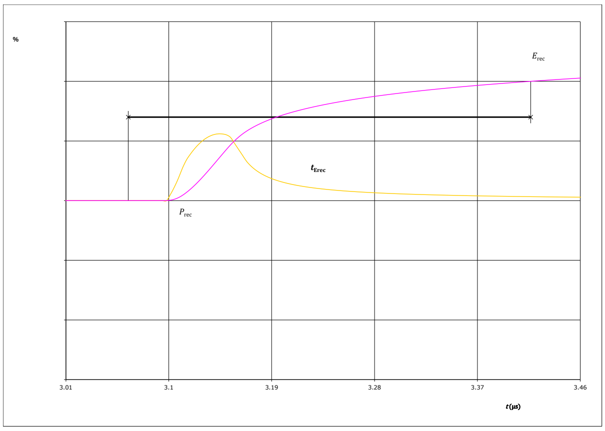


figure 34.	FWD

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



Ordering Code

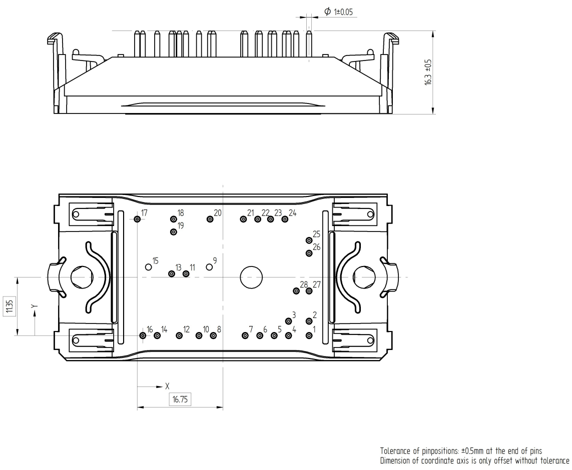
Version	Ordering Code
Without thermal paste	10-FZ062TA080P7-P980D78
With thermal paste (5,2 W/mK, PTM6000HV)	10-FZ062TA080P7-P980D78-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FZ062TA080P7-P980D78-/3/

Marking

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

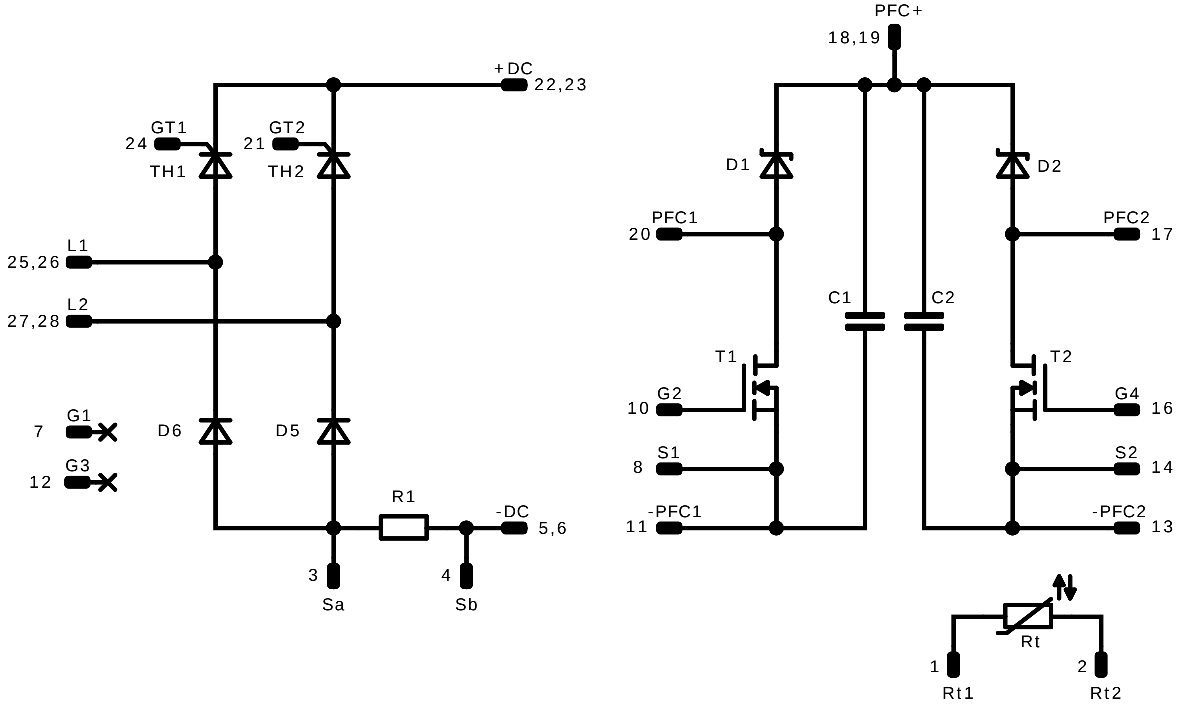
Outline

Pin table [mm]			
Pin	X	Y	Function
1	33,5	0	Rt1
2	33,5	2,8	Rt2
3	29,5	2,8	Sa
4	29,5	0	Sb
5	26,7	0	-DC
6	23,9	0	-DC
7	21,05	0	G1
8	14,85	0	S1
9	not assembled		
10	12,05	0	G2
11	9,5	12,05	-PFC1
12	8,2	0	G3
13	6,7	12,05	-PFC2
14	3,9	0	S2
15	not assembled		
16	1,1	0	G4
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	GT2
22	23,5	22,7	+DC
23	26	22,7	+DC
24	28,8	22,7	GT1
25	33,5	18,55	L1
26	33,5	16,05	L1
27	33,5	8,7	L2
28	31	8,7	L2



10-FZ062TA080P7-P980D78
datasheet

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1, T2	MOSFET	600 V	69 mΩ	PFC Switch	
D1, D2	FWD	600 V	10 A	PFC Diode	
TH1, TH2	Thyristor	1200 V	25 A	Rectifier Thyristor	
D6, D5	Rectifier	1600 V	50 A	Rectifier Diode	
R1	Shunt			PFC Shunt	
C1, C2	Capacitor	500 V		Capacitor (DC)	
Rt	Thermistor			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-FZ062TA080P7-P980D78-D1-14	16 Jun. 2022		