Vincotech

10-FZ072TA030SL-PN00D03
datasheet

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

Topology features

- 3x Shunts
- Converter + 2-leg interleaved PFC
- On-board Capacitors
- Open Emitter configuration
- Temperature sensor

Component features

- Highest efficiency in hard switching and resonant topologies
- Lowest switching losses
- Optimized for ultra-fast 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

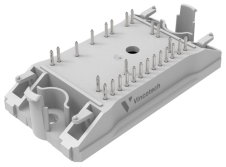
Target applications

- Embedded Drives
- Heat Pumps
- HVAC
- Industrial Drives

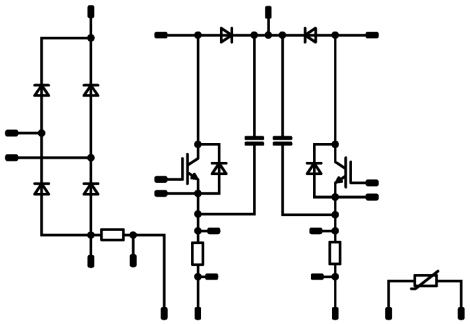
Types

- 10-FZ072TA030SL-PN00D03

flow 0 12 mm housing



Schematic



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	26	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	46	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	43	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	60	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms T_j = 25 °C	310	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	56	W
Maximum junction temperature	T_{jmax}		175	°C
PFC Sw. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	T_j = T_{jmax} T_s <= 80 °C	10 (1)	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	10	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	27	W
Maximum junction temperature	T_{jmax}		175	°C

(1) limited by I_{FRM}

DC-Link Shunt				
DC current	I		50	A
Power dissipation	P_{tot}	T_c = 70 °C	5	W
Operation Temperature	T_{op}		-55 ... 170	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Rectifier Diode				
Peak repetitive reverse voltage	V_{RRM}		1600	V
Forward current (DC current)	I_F	T_j = T_{jmax}, T_s = 80 °C	52	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms, T_j = 150 °C	400	A
Surge current capability	I^2t		800	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		31,6	A
Power dissipation	P_{tot}	T_c = 70 °C	2	W
Operation Temperature	T_{op}		-65 ... 170	°C
Capacitor (DC)				
Maximum DC voltage	V_{MAX}		630	V
Operation Temperature	T_{op}		-55 ... 150	°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	6000	V
Creepage distance			>12,7	mm
Clearance			9,01	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										
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		1,65 1,81 1,86	2,22(2)	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		1800		pF
Output capacitance	C_{oes}							45		pF
Reverse transfer capacitance	C_{res}							9		pF
Gate charge	Q_g	V_{CC} = 520 V	15		30	25		65		nC
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						2,05		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 32 Ω R_{goff} = 32 Ω	0/15	400	30	25 125 150		35,43 32,19 29,43		ns
Rise time	t_r					25 125 150		12,61 15,6 12,74		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		220,26 242,82 249,42		ns
Fall time	t_f					25 125 150		11,1 2,1 2,3		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,338 µC Q_{rFWD}=1,03 µC Q_{rFWD}=1,42 µC				25 125 150		0,689 0,949 0,868		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,172 0,25 0,281		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	25 125 150		1,67 1,33 1,24	2,5[2]	V
Reverse leakage current	I_R	V_r = 600 V				25			20	µA
Thermal										
Thermal resistance junction to sink[3]	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						1,7		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=2941 A/µs di/dt=2065 A/µs di/dt=2887 A/µs	0/15	400	30	25 125 150		25,99 32,43 47,14		A
Reverse recovery time	t_{rr}					25 125 150		22,31 65,12 54,57		ns
Recovered charge	Q_r					25 125 150		0,338 1,03 1,42		µC
Reverse recovered energy	E_{rec}					25 125 150		0,02 0,089 0,161		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3581,05 1585,2 2278,56		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				5	25 125 150		1,57 1,66 1,65	2,1(2)	V
Reverse leakage current	I_R	V_r = 1200 V				25			20	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						3,57		K/W
DC-Link Shunt										
Static										
Resistance	R							2		mΩ
Temperature coeficient	tc								50	ppm/K
Rectifier Diode										
Static										
Forward voltage	V_F				35	25 125 150		1,09 1,03 1,02	1,5(2)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 2000	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						1,19		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							2		mΩ
Temperature coeficient	tc								275	ppm/K
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		33		nF
Tolerance							-5		5	%
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	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	

(2) Value at chip level

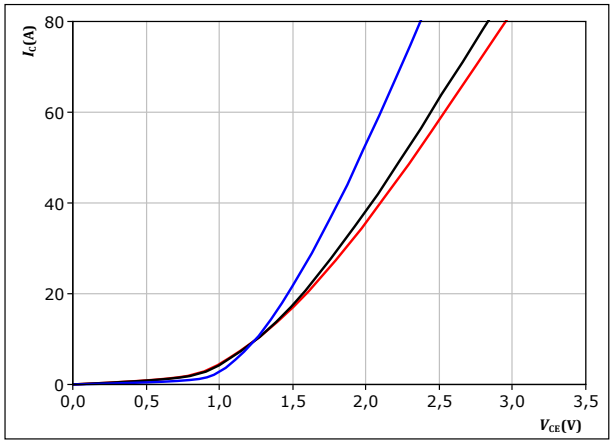
(3) Only valid with pre-applied Vincotech thermal interface material.

PFC Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

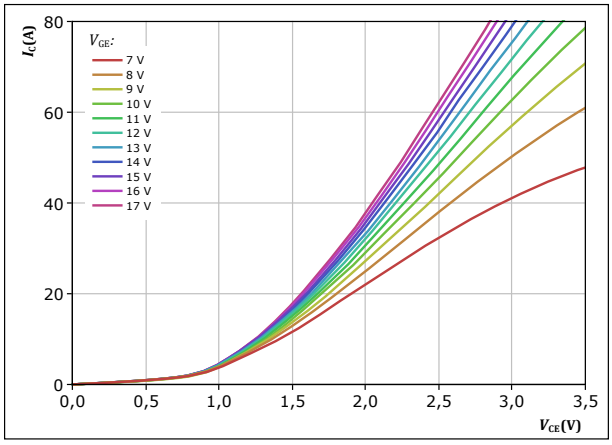


t_p =	250	µs		
V_{GE} =	15	V	T_j:	25 °C
				125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



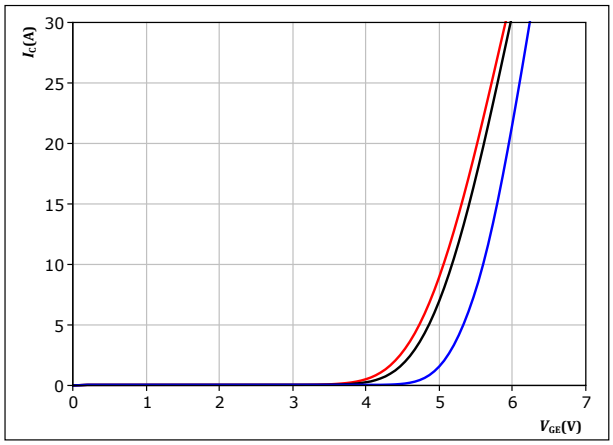
t_p =	250	µs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

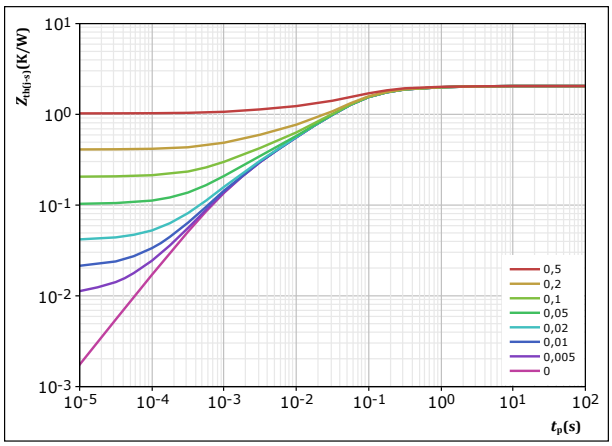


t_p =	250	µs		
V_{CE} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	2,05	K/W

IGBT thermal model values

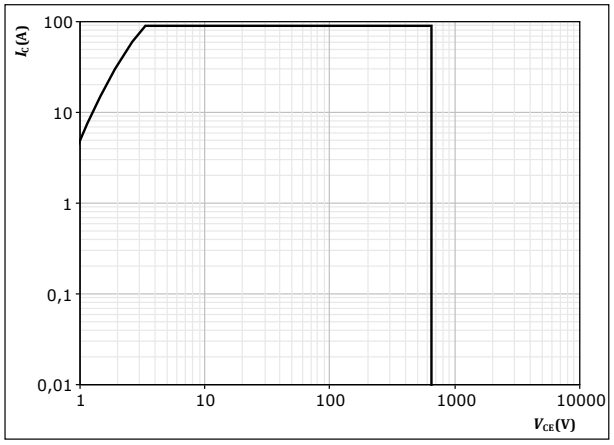
R (K/W)	τ (s)
9,83E-02	1,74E+00
2,98E-01	2,42E-01
1,21E+00	5,71E-02
2,88E-01	8,79E-03
1,55E-01	1,30E-03

PFC Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$

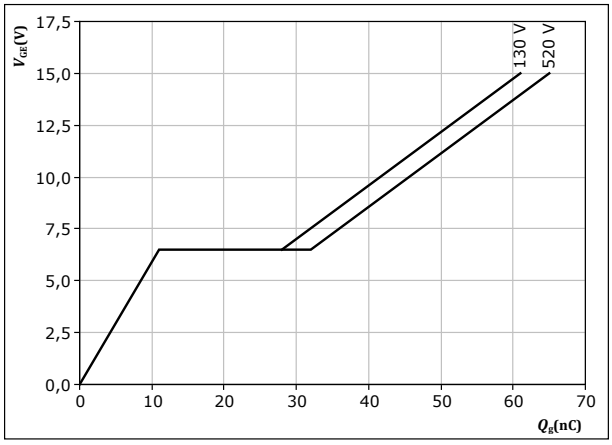


$D =$ single pulse
$T_s =$ 80 °C
$V_{GE} =$ 15 V
$T_j =$ T_{jmax}

figure 6. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_g)$



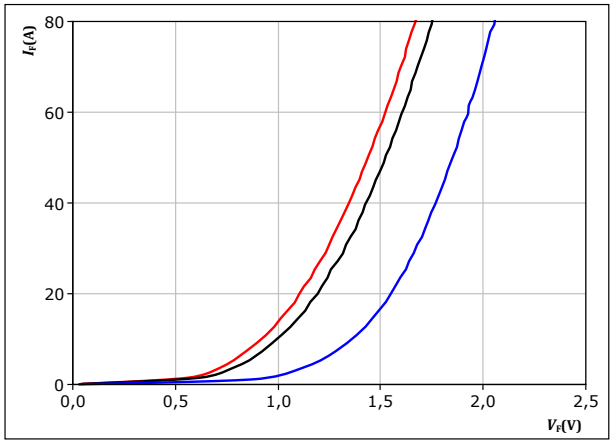
$I_C =$ 30 A
$T_j =$ 25 °C

PFC Diode Characteristics

figure 7. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



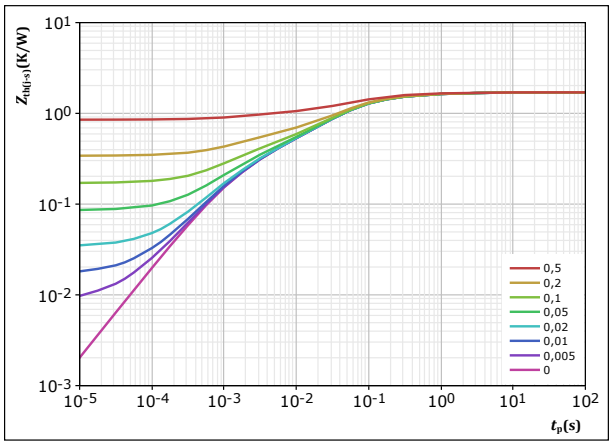
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 8. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,703 K/W

FWD thermal model values

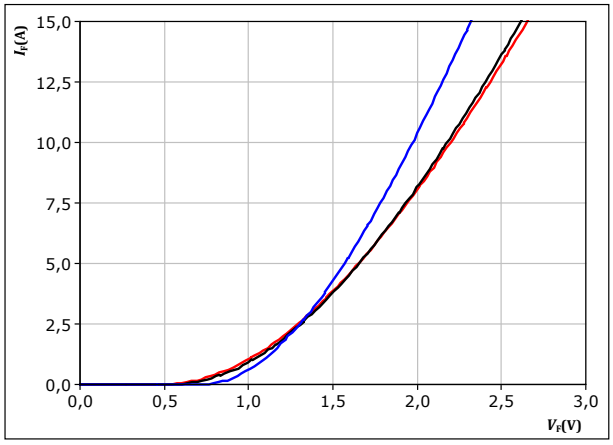
R (K/W)	τ (s)
8,25E-02	2,83E+00
2,62E-01	3,17E-01
8,95E-01	5,54E-02
2,69E-01	8,91E-03
1,95E-01	1,25E-03

PFC Sw. Protection Diode Characteristics

figure 9. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



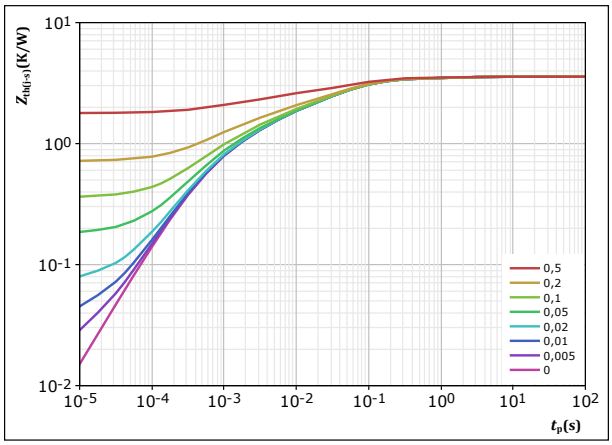
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 10. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 3,572 K/W

FWD thermal model values

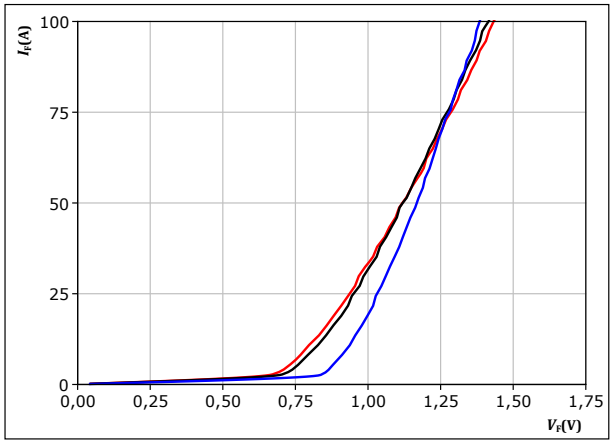
R (K/W)	τ (s)
1,62E-01	1,61E+00
8,99E-01	9,70E-02
1,06E+00	2,46E-02
8,96E-01	2,98E-03
5,56E-01	4,78E-04

Rectifier Diode Characteristics

figure 11. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



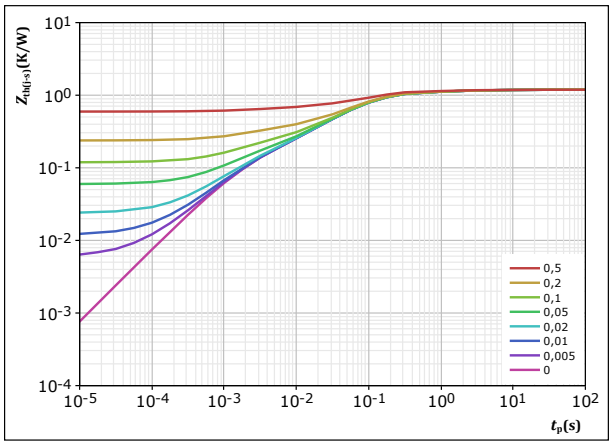
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 12. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,19 K/W

Rectifier thermal model values

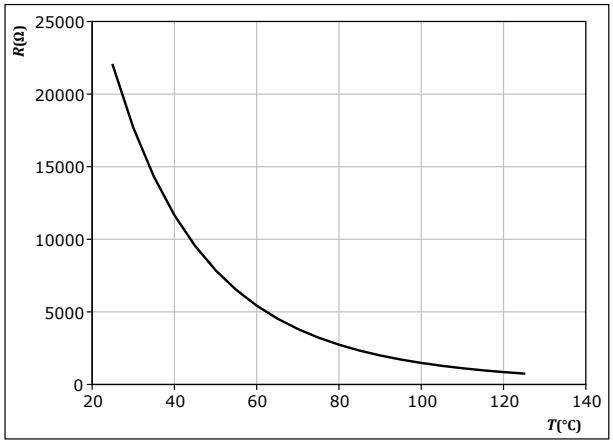
R (K/W)	τ (s)
3,49E-02	7,24E+00
1,42E-01	7,96E-01
7,75E-01	8,48E-02
1,43E-01	1,43E-02
9,52E-02	1,67E-03

Thermistor Characteristics

figure 13. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

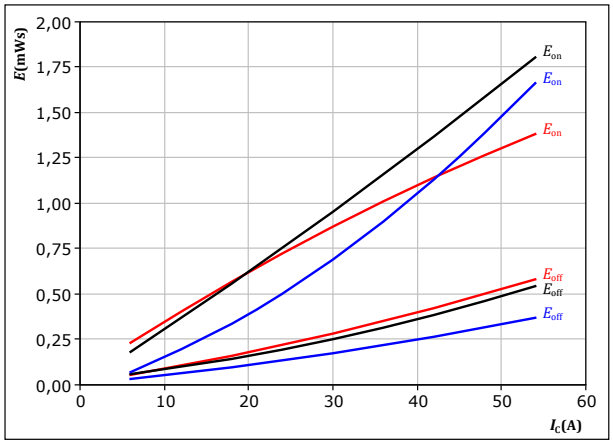


PFC Switching Characteristics

figure 14. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



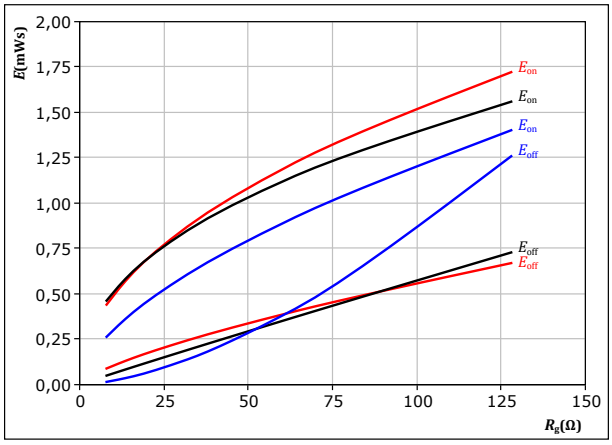
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
R_{gon} =	32	Ω	150 °C
R_{goff} =	32	Ω	

figure 15. **IGBT**

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

$E = f(R_g)$



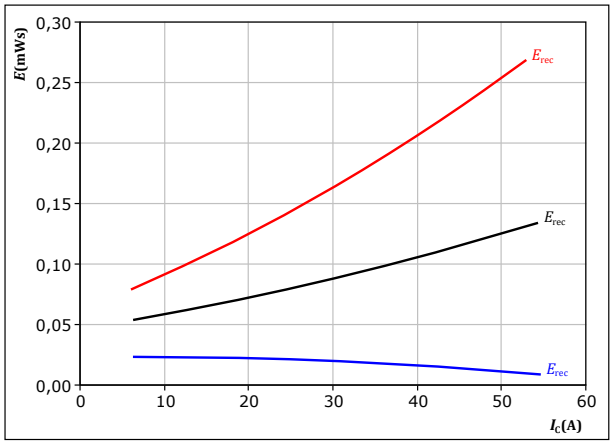
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
I_C =	30	A	150 °C

figure 16. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



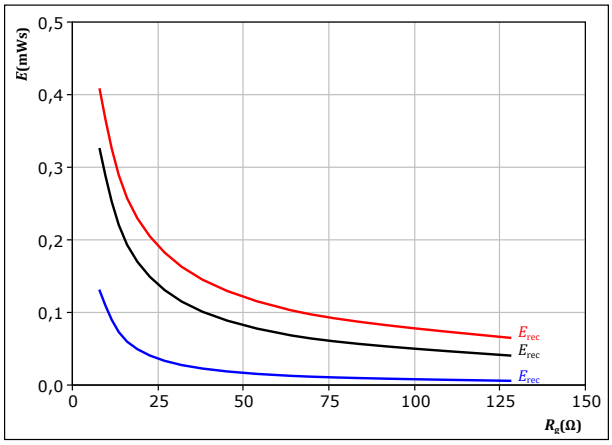
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
R_{gon} =	32	Ω	150 °C

figure 17. **FWD**

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

$E_{rec} = f(R_g)$



With an inductive load at

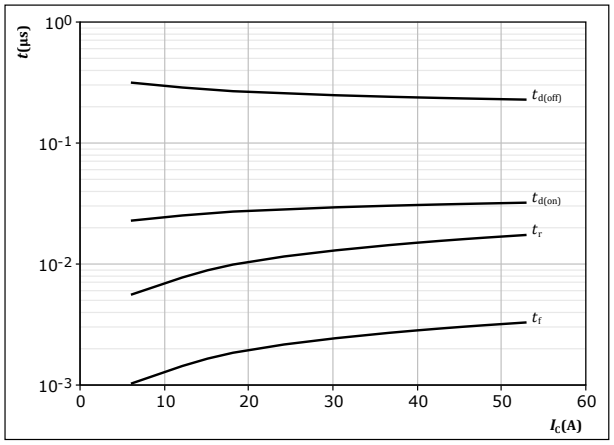
V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
I_C =	30	A	150 °C

PFC Switching Characteristics

figure 18. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



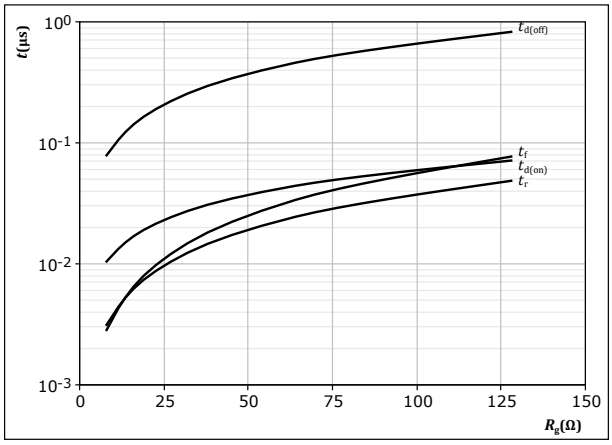
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	32	Ω
R_{goff} =	32	Ω

figure 19. **IGBT**

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

$t = f(R_g)$



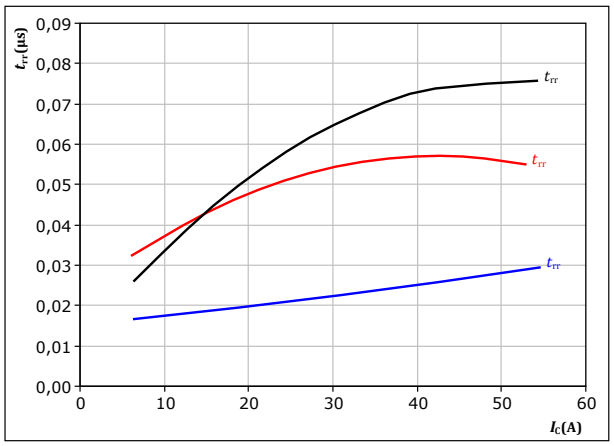
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	30	A

figure 20. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

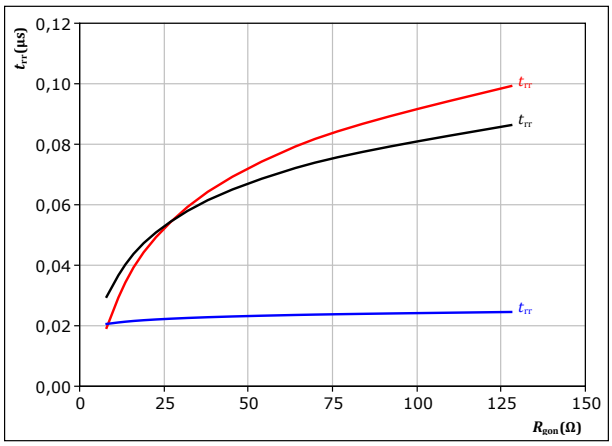
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	32	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 21. **FWD**

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

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



With an inductive load at

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

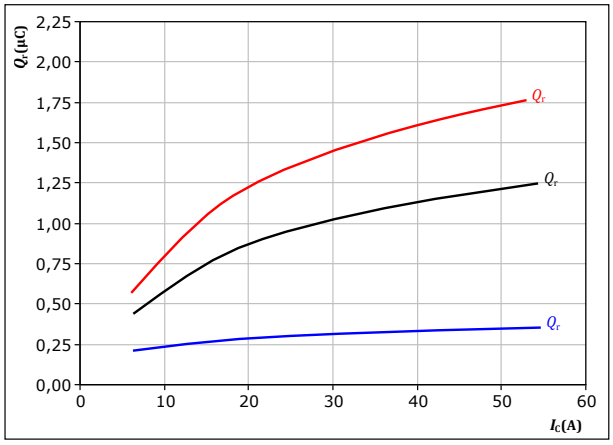
T_j: 25 °C, 125 °C, 150 °C

PFC Switching Characteristics

figure 22. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



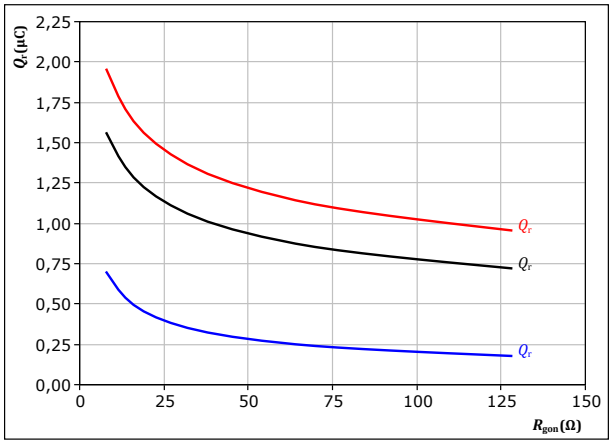
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
R_{gon} =	32	Ω	150 °C

figure 23. **FWD**

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

$Q_r = f(R_{gon})$



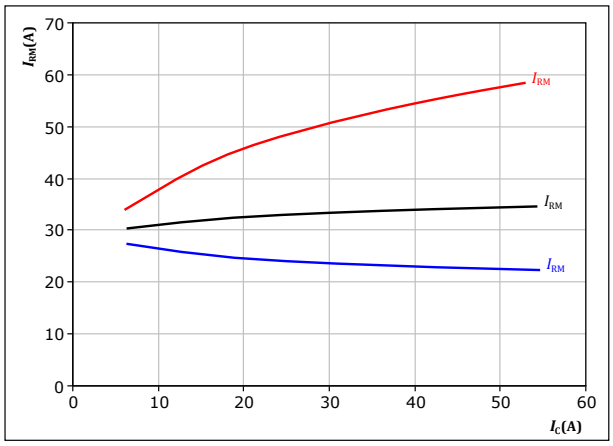
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
I_C =	30	A	150 °C

figure 24. **FWD**

Typical peak reverse recovery current as a function of collector current

$I_{RM} = f(I_C)$



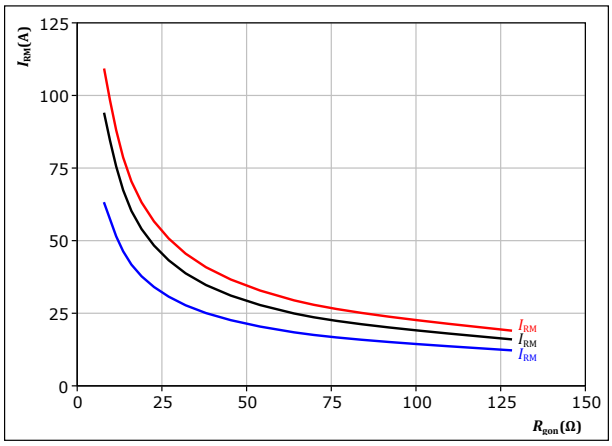
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
R_{gon} =	32	Ω	150 °C

figure 25. **FWD**

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

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



With an inductive load at

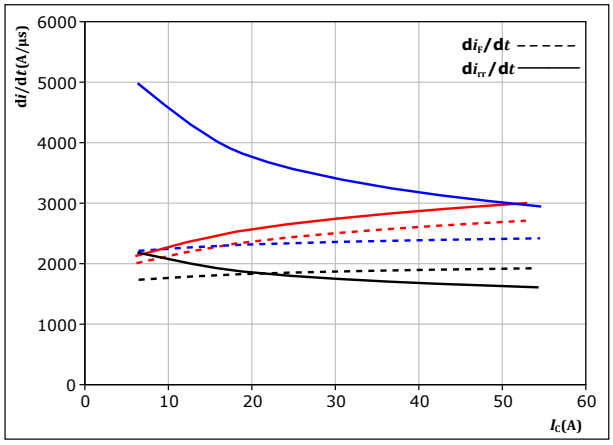
V_{CE} =	400	V	T_j: 25 °C
V_{GE} =	0/15	V	125 °C
I_C =	30	A	150 °C

PFC Switching Characteristics

figure 26. **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)



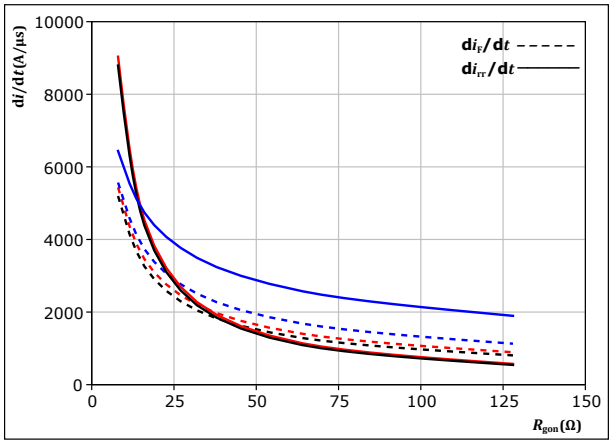
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	32	Ω		150 °C

figure 27. **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})



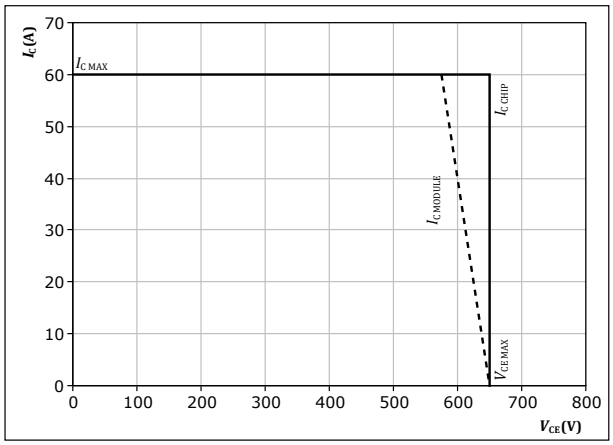
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	30	A		150 °C

figure 28. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At

T_j =	150	°C	
R_{gon} =	32	Ω	
R_{goff} =	32	Ω	

PFC Switching Definitions

figure 29. **IGBT**

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

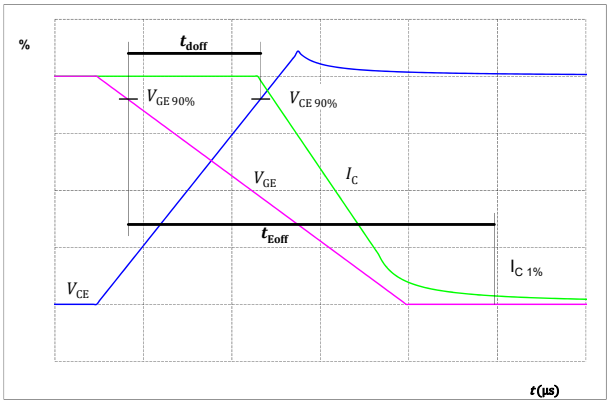


figure 30. **IGBT**

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

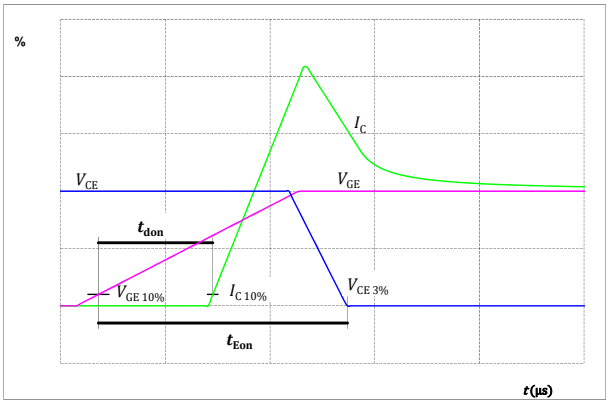


figure 31. **IGBT**

Turn-off Switching Waveforms & definition of t_f

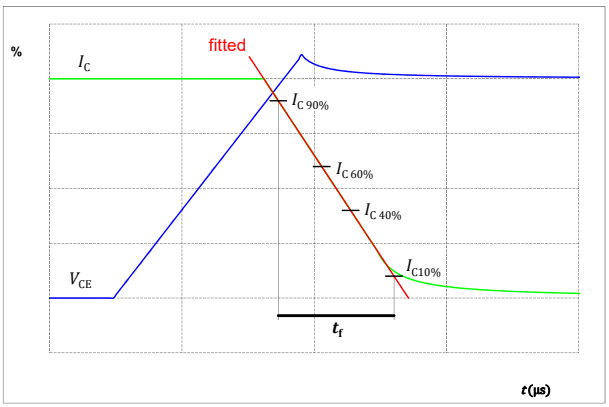
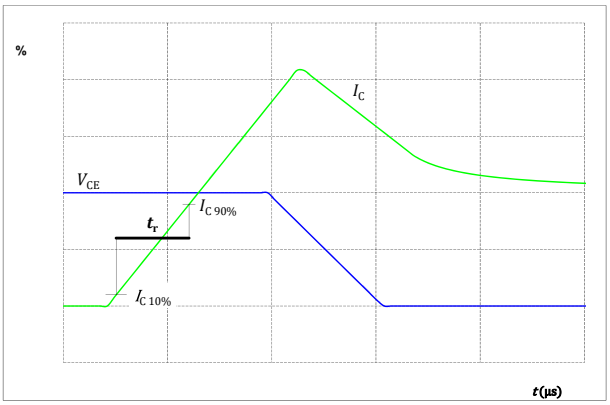


figure 32. **IGBT**

Turn-on Switching Waveforms & definition of t_r



PFC Switching Definitions

figure 33. **FWD**

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

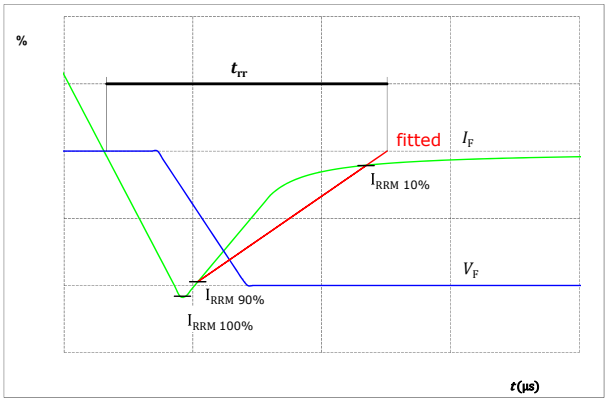
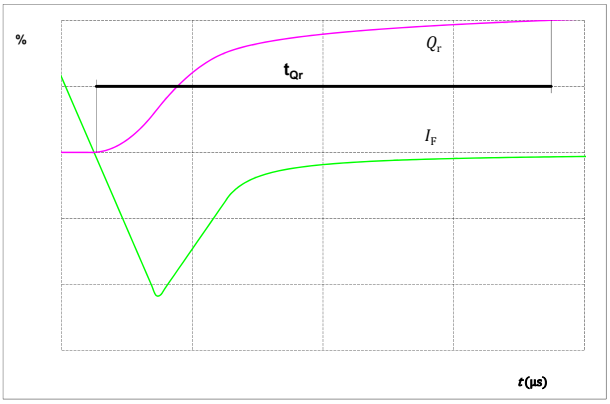


figure 34. **FWD**

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



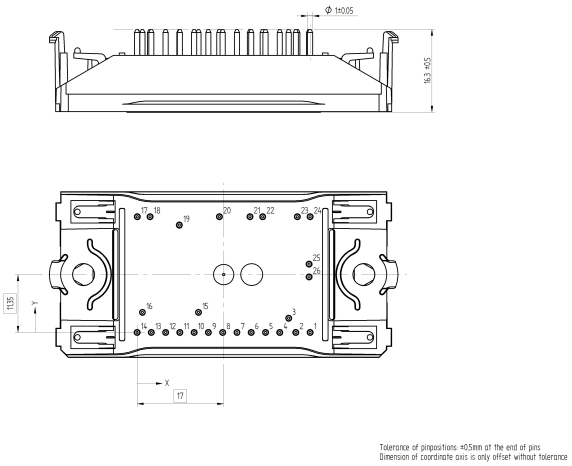
Ordering Code	
Version	**Ordering Code**
Without thermal paste	10-FZ072TA030SL-PN00D03
With thermal paste (5,2 W/mK, PTM6000HV)	10-FZ072TA030SL-PN00D03-/7/

Marking

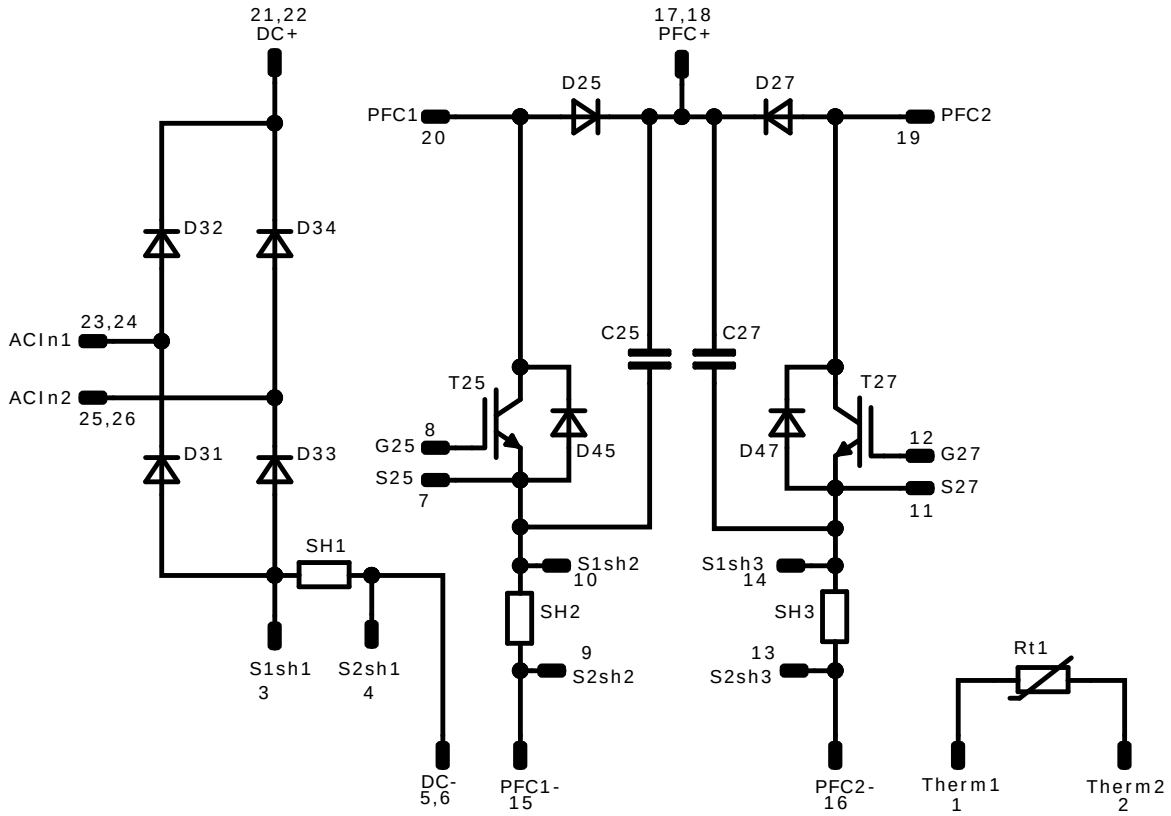
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	33,95	0	Therm1
2	31,15	0	Therm2
3	29,75	2,8	S1sh1
4	28	0	S2sh1
5	25,2	0	DC-
6	22,4	0	DC-
7	19,6	0	S25
8	16,8	0	G25
9	14	0	S2sh2
10	11,2	0	S1sh2
11	8,4	0	S27
12	5,6	0	G27
13	2,8	0	S2sh3
14	0	0	S1sh3
15	12,05	3,95	PFC1-
16	1,05	3,95	PFC2-
17	0,05	22,7	PFC+
18	2,55	22,7	PFC+
19	8,3	21,05	PFC2
20	16,15	22,7	PFC1
21	22,15	22,7	DC+
22	24,65	22,7	DC+
23	31,45	22,7	ACIn1
24	33,95	22,7	ACIn1
25	33,75	13,4	ACIn2
26	33,75	10,9	ACIn2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
SH1	Shunt			DC-Link Shunt	
T25, T27	IGBT	650 V	30 A	PFC Switch	
D25, D27	FWD	600 V	30 A	PFC Diode	
D45, D47	FWD	1200 V	5 A	PFC Sw. Protection Diode	
D31, D32, D33, D34	Rectifier	1600 V	35 A	Rectifier Diode	
SH2, SH3	Shunt			PFC Shunt	
C25, C27	Capacitor	630 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 UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}$=175°C and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-FZ072TA030SL-PN00D03-D1-14	24 Oct. 2024	Initial Release	