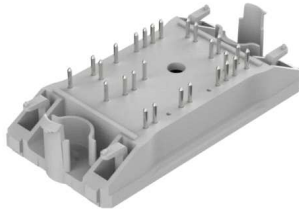
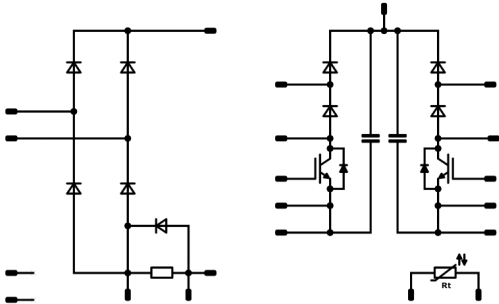




Vincotech

<i>flow</i> PFC 0 CD	600 V / 30 A
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> High-efficient rectifier High-efficient IGBT H5 + Stealth 2 Diode Ultra-fast switching speed Integrated capacitors Thermistor 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">flow0 12mm housing</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> SMPS Welding 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Schematic</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> 10-FZ062TA030SM-P986D13 	

Maximum Ratings

$T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
PFC Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ }^\circ\text{C}$	28	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ }^\circ\text{C}$	57	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum Junction Temperature	T_{jmax}		175	°C



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
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PFC Diode

Peak Repetitive Reverse Voltage	V_{RRM}		600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{°C}$	26	A
Repetitive peak forward current	I_{FRM}		90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{°C}$	48	W
Maximum Junction Temperature	T_{jmax}		150	°C

PFC Protection \ Current Transforme Protection Diode

Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{°C}$	17	A
Repetitive peak forward current	I_{FRM}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{°C}$	33	W
Maximum Junction Temperature	T_{jmax}		175	°C

Rectifier \ Shunt Protection Diode

Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_h = 80\text{°C}$	46	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ 50 Hz sine $T_j = 150\text{°C}$	280	A
Surge current capability	I^2t		390	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_h = 80\text{°C}$	59	W
Maximum Junction Temperature	T_{jmax}		150	°C

DC Link Capacitor

Maximum DC voltage	V_{MAX}		1000	V
Operation Temperature	T_{op}		-55...+125	°C

PFC Shunt

DC forward current	I_F	$T_c = 25\text{°C}$	22	A
Power dissipation	P_{tot}	$T_c = 105\text{°C}$	5	W



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
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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 Voltage $t_p = 2s$	4000	V
Creepage distance			min. 12,7	mm
Clearance			9,42	mm
Comparative Tracking Index	CTI		> 200	



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

PFC Switch

Static

Parameter	Symbol	Conditions	V_{GE} [V]	V_{GS} [V]	V_{CE} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$				0,0003		25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15			30		25 125		1,69 1,92	2,22	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}	$f = 1\text{MHz}$	0	25				25		2100		pF
Reverse transfer capacitance	C_{res}											
Gate charge	Q_g		15	520	30			25		70		nC

Thermal

Parameter	Symbol	Conditions	V_{GE} [V]	V_{GS} [V]	V_{CE} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4 \text{ W/mK}$								1,67		K/W

IGBT Switching

Parameter	Symbol	Conditions	V_{GE} [V]	V_{GS} [V]	V_{CE} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit		
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 16 \Omega$ $R_{gon} = 16 \Omega$	15/0	400	30			25 125		25 23		ns		
Rise time	t_r												25 125	10 11
Turn-off delay time	$t_{d(off)}$												25 125	144 159
Fall time	t_f												25 125	4 7
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD} = 0,3 \mu\text{C}$ $Q_{rFWD} = 0,8 \mu\text{C}$						25 125		0,445 0,715		mWs		
Turn-off energy (per pulse)	E_{off}												25 125	0,132 0,225



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit	
		V_{GE} [V]	V_{GS} [V]	V_{CE} [V]	V_{GS} [V]	V_r [V]	I_C [A]	I_D [A]	I_F [A]		T_j [°C]

PFC Diode

Static

Forward voltage	V_F				30	25 125		2,34 2,01	2,8	V
Reverse leakage current	I_r			600		25			100	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						1,46		K/W
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FWD Switching

Peak recovery current	I_{RRM}	$di/dt = 2682$ A/ μ s $di/dt = 2448$ A/ μ s	15/0	400	30	25		18		A
						125		28		
Reverse recovery time	t_{rr}					25		16		ns
						125		45		
Recovered charge	Q_r					25		0,269		μ C
		125		0,790						
Reverse recovered energy	E_{rec}	25		0,046		mWs				
		125		0,100						
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$	25		4655		A/ μ s				
		125		1857						

PFC Protection \ Current Transforme Protection Diode

Static

Forward voltage	V_F				10	25 125		1,67 1,56	1,87	V
Reverse leakage current	I_r			650		25			0,14	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						2,87		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

Rectifier \ Shunt Protection Diode

Static

Forward voltage	V_F				30	25 125		1,16 1,11	1,3	V
Reverse leakage current	I_r			1600		25 150			20 1500	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK						1,19		K/W
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Vincotech

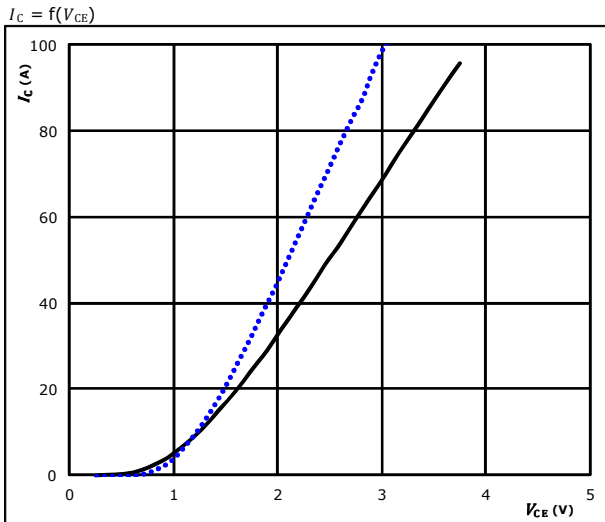
Characteristic Values

Parameter	Symbol	Conditions					Value			Unit			
		V_{GE} [V]	V_{GS} [V]	V_{CE} [V]	V_{GS} [V]	V_r [V]	I_C [A]	I_D [A]	I_F [A]		T_j [°C]	Min	Typ
DC Link Capacitor													
Capacitance	C										100		nF
Tolerance										-10		+10	%
PFC Shunt													
R1 value	R										10		mΩ
Temperature coefficient	t_c						20 - 60					50	ppm/K
Internal heat resistance	R_{thi}											13	K/W
Inductance	L											3	nH
Thermistor													
Rated resistance	R						25				22		kΩ
Deviation of R100	$\Delta_{R/R}$	R100 = 1486 Ω					100	-12				+14	%
Power dissipation	P						25				200		mW
Power dissipation constant							25				2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%					25				3950		K
B-value	$B_{(25/100)}$	Tol. ±3%					25				3998		K
Vincotech NTC Reference												B	



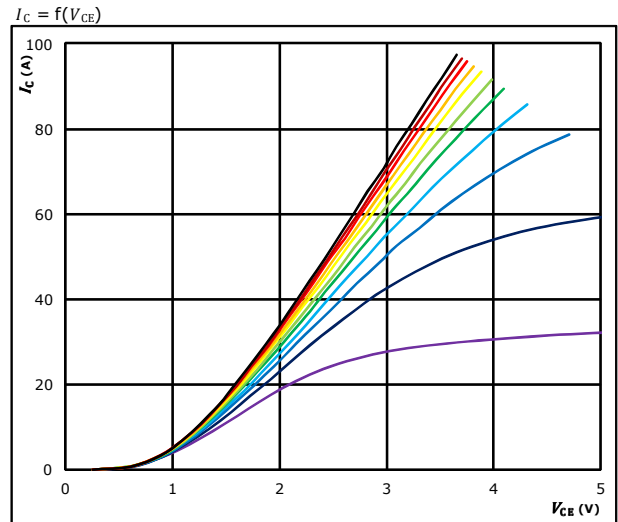
PFC Switch Characteristics

Typical output characteristics IGBT



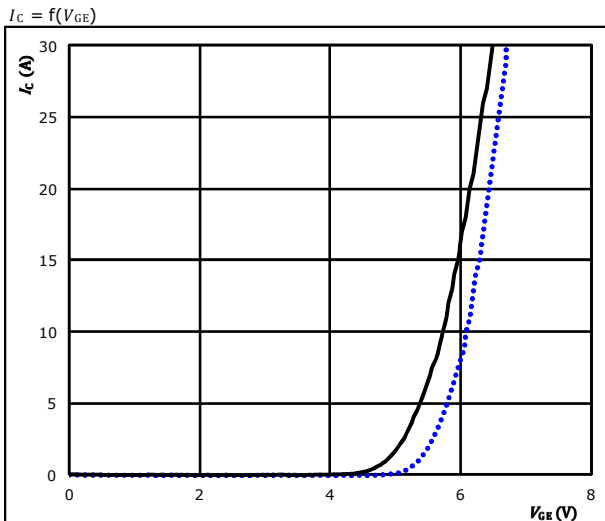
$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 \text{ }^\circ C$ (solid line)
 $125 \text{ }^\circ C$ (dotted line)

Typical output characteristics IGBT



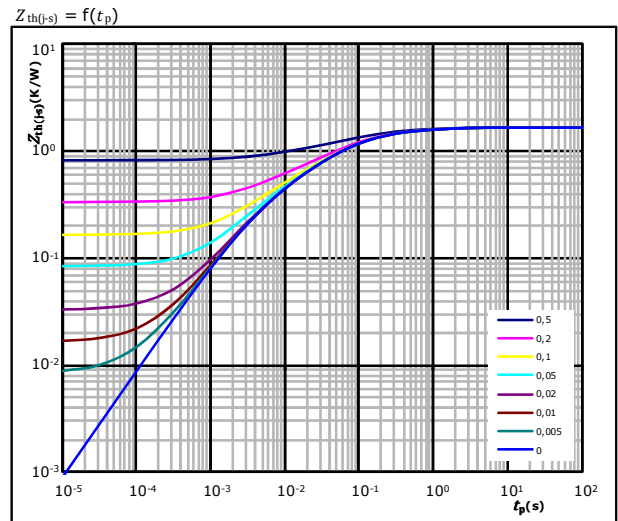
$t_p = 250 \mu s$
 $T_j = 125 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

Typical transfer characteristics IGBT



$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ }^\circ C$ (dotted line)
 $125 \text{ }^\circ C$ (solid line)

Transient Thermal Impedance as function of Pulse duration IGBT



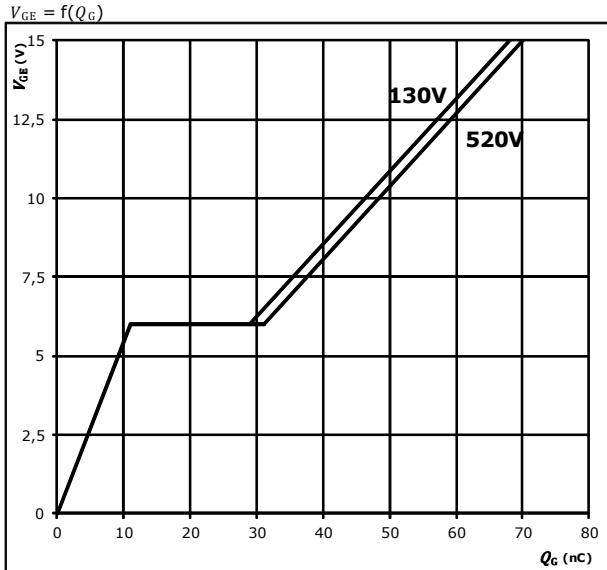
$D = t_p / T$
 $R_{th(j-s)} = 1,67 \text{ K/W}$
IGBT thermal model values

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



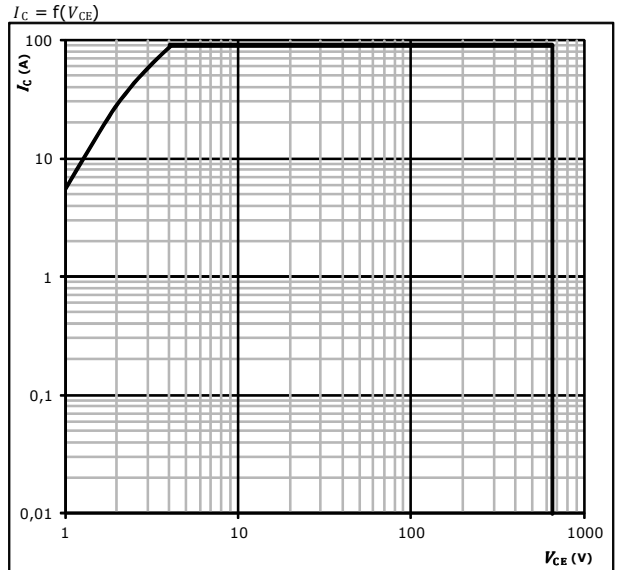
PFC Switch Characteristics

Gate voltage vs Gate charge IGBT



At
 $I_C = 30$ A

Safe operating area IGBT

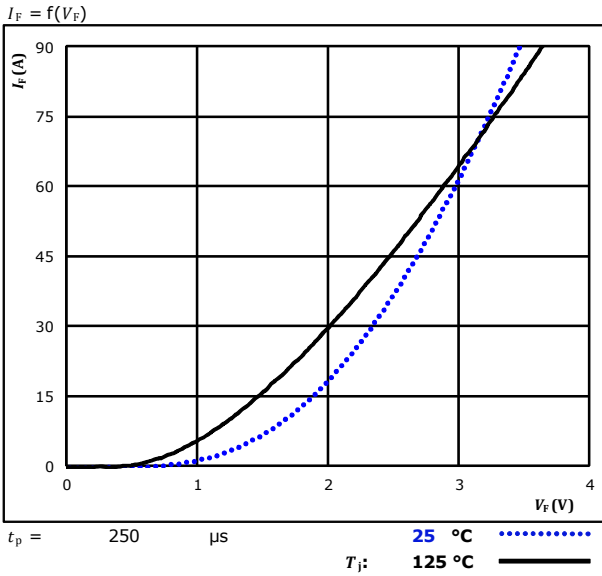


At
 $D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$ °C

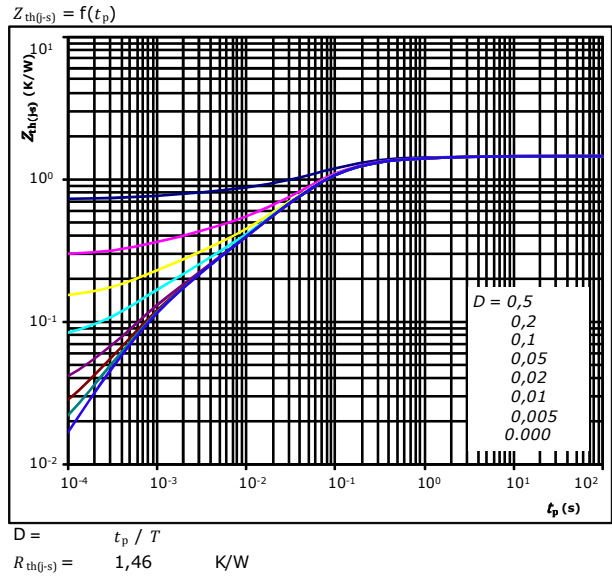


PFC Diode Characteristics

Typical forward characteristics FWD



Transient thermal impedance as a function of pulse width FWD



FWD thermal model values

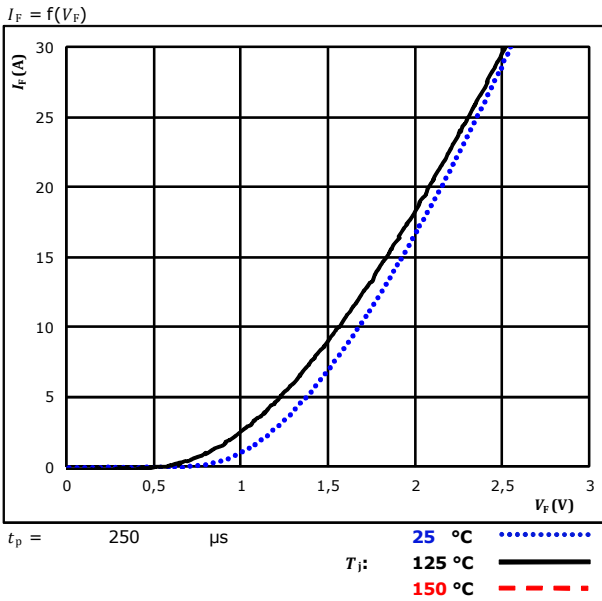
R (K/W)	τ (s)
6,8400E-02	2,7070E+00
1,8520E-01	3,2380E-01
7,7650E-01	6,8840E-02
2,2980E-01	1,9350E-02
1,1460E-01	3,4610E-03
8,1930E-02	7,0190E-04



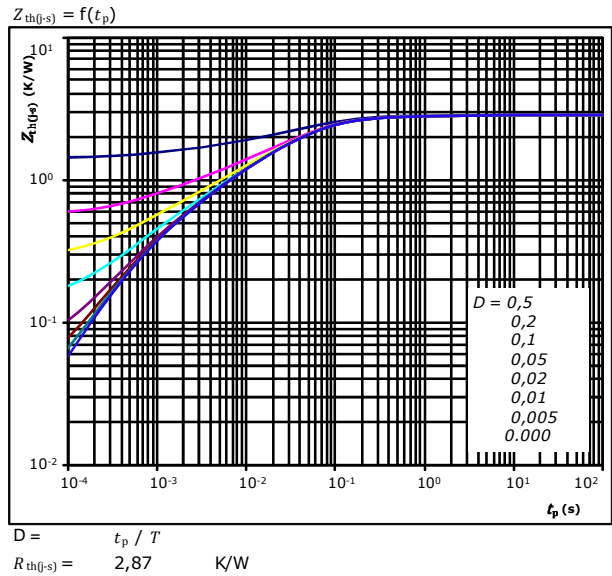
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PFC Protection \ Current Transformer Protection Diode Characteristics

Typical forward characteristics Prot. Diode



Transient thermal impedance as a function of pulse width Prot. Diode



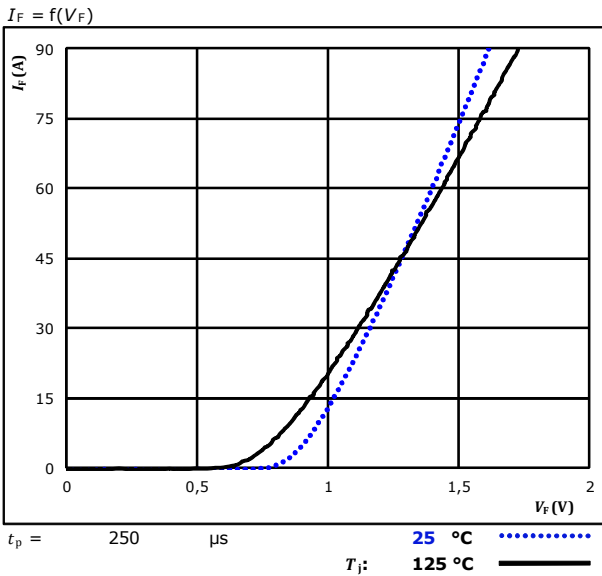
Prot. Diode thermal model values

R (K/W)	τ (s)
6,5290E-02	3,9390E+00
1,4760E-01	4,4830E-01
1,3130E+00	5,9640E-02
7,3180E-01	1,3610E-02
4,0440E-01	2,7940E-03
2,1060E-01	5,3720E-04

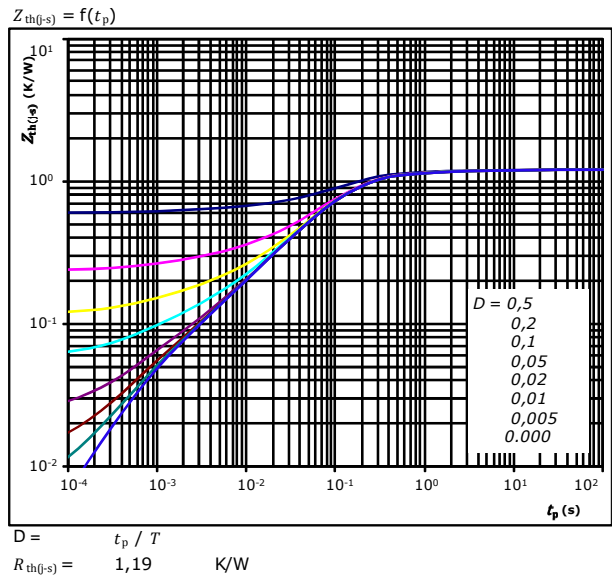


Rectifier \ Shunt Protection Diode Characteristics

Typical forward characteristics Diode



Transient thermal impedance as a function of pulse width Diode



Diode thermal model values

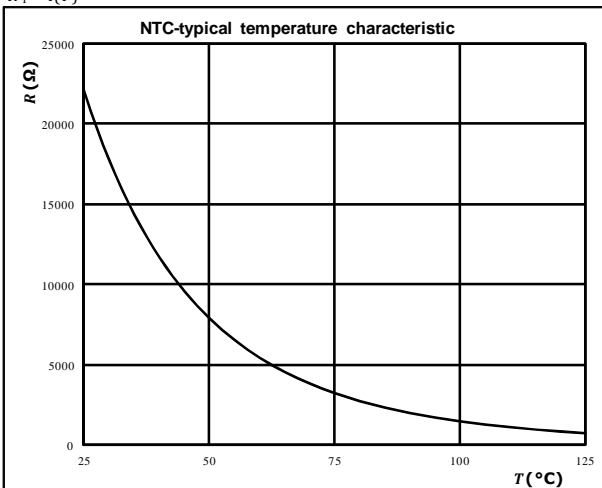
R (K/W)	τ (s)
3,27E-02	9,47E+00
1,25E-01	7,59E-01
7,11E-01	1,23E-01
2,20E-01	3,75E-02
6,56E-02	5,63E-03
3,68E-02	8,27E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic
as a function of temperature

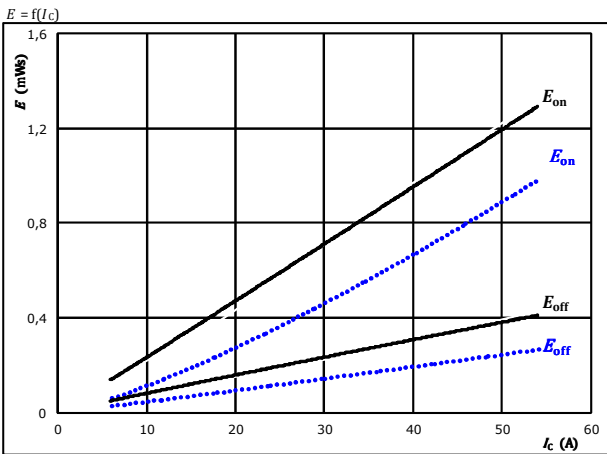
$R_T = f(T)$





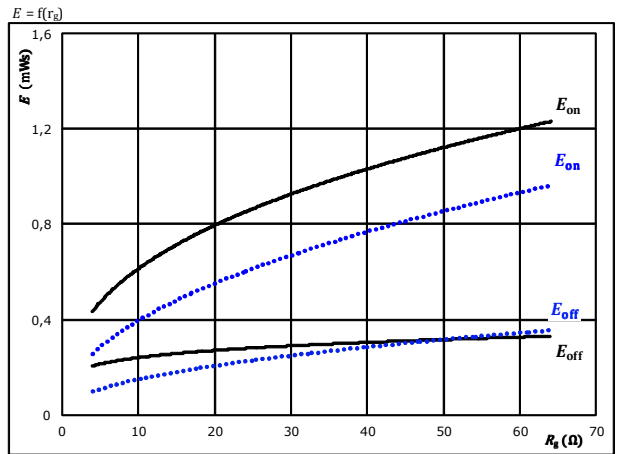
PFC Switching Characteristics

Figure 1. IGBT
Typical switching energy losses as a function of collector current



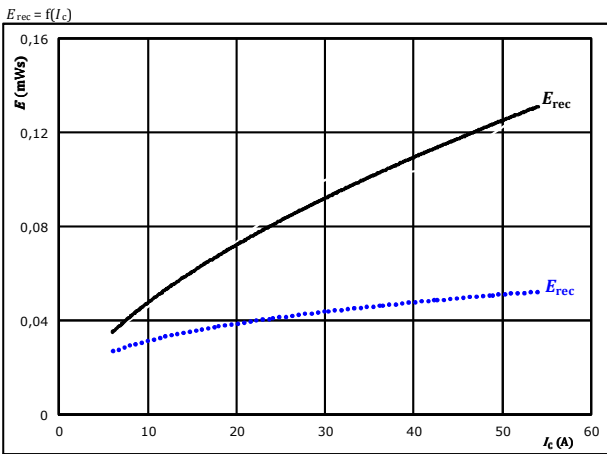
With an inductive load at
 $V_{CE} = 400 \text{ V}$
 $V_{GE} = 15/0 \text{ V}$
 $R_{gon} = 16 \text{ } \Omega$
 $R_{goff} = 16 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$ (dotted blue)
 $125 \text{ } ^\circ\text{C}$ (solid black)

Figure 2. IGBT
Typical switching energy losses as a function of gate resistor



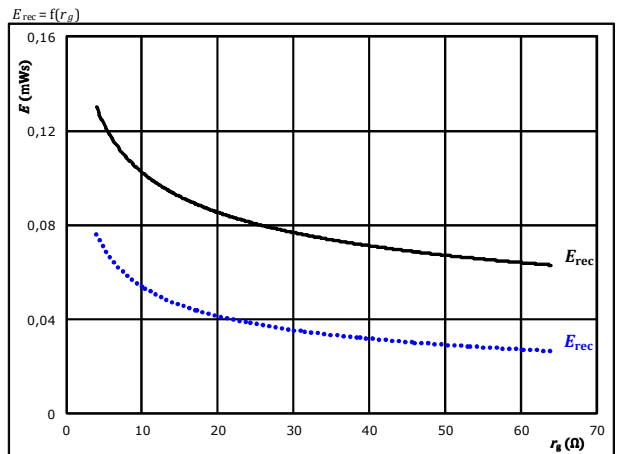
With an inductive load at
 $V_{CE} = 400 \text{ V}$
 $V_{GE} = 15/0 \text{ V}$
 $I_C = 30 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$ (dotted blue)
 $125 \text{ } ^\circ\text{C}$ (solid black)

Figure 3. FWD
Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 400 \text{ V}$
 $V_{GE} = 15/0 \text{ V}$
 $R_{gon} = 16 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$ (dotted blue)
 $125 \text{ } ^\circ\text{C}$ (solid black)

Figure 4. FWD
Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 400 \text{ V}$
 $V_{GE} = 15/0 \text{ V}$
 $I_C = 30 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$ (dotted blue)
 $125 \text{ } ^\circ\text{C}$ (solid black)



PFC Switching Characteristics

Figure 5. IGBT
Typical switching times as a function of collector current

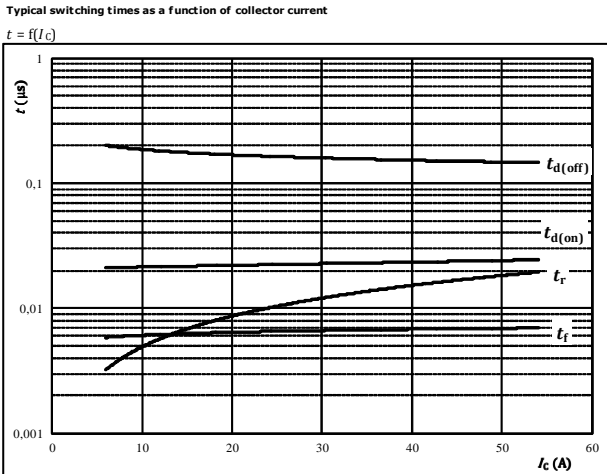


Figure 6. IGBT
Typical switching times as a function of gate resistor

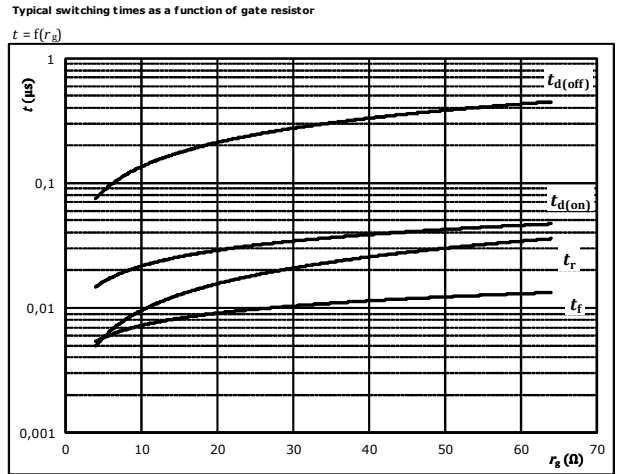


Figure 7. FWD
Typical reverse recovery time as a function of collector current

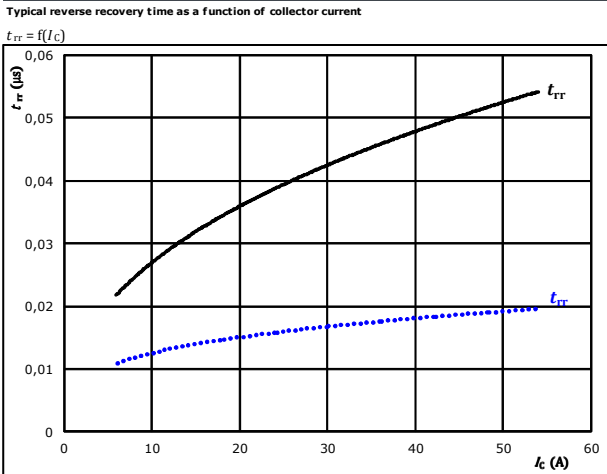
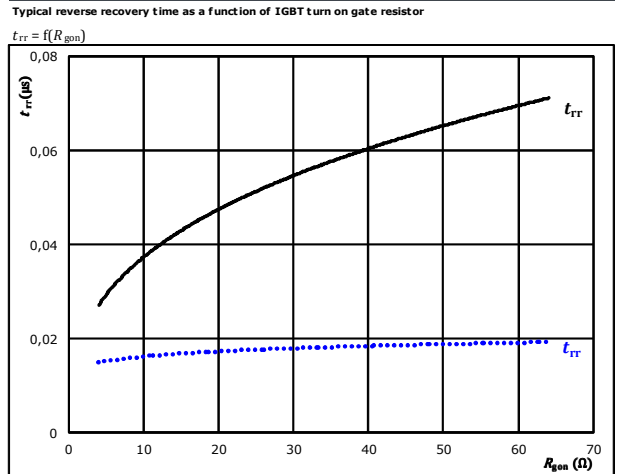


Figure 8. FWD
Typical reverse recovery time as a function of IGBT turn on gate resistor





PFC Switching Characteristics

Figure 9. FWD
Typical recovered charge as a function of collector current

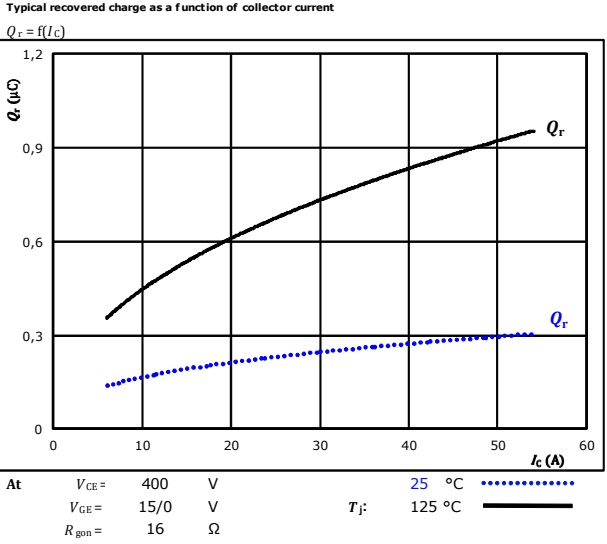


Figure 10. FWD
Typical recovered charge as a function of IGBT turn on gate resistor

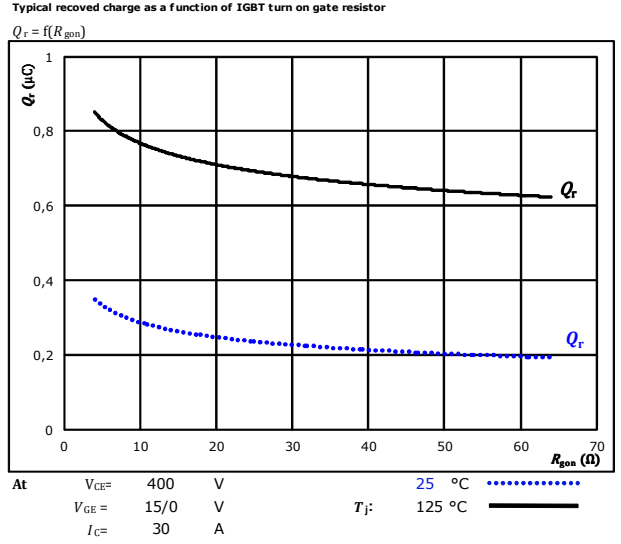


Figure 11. FWD
Typical peak reverse recovery current as a function of collector current

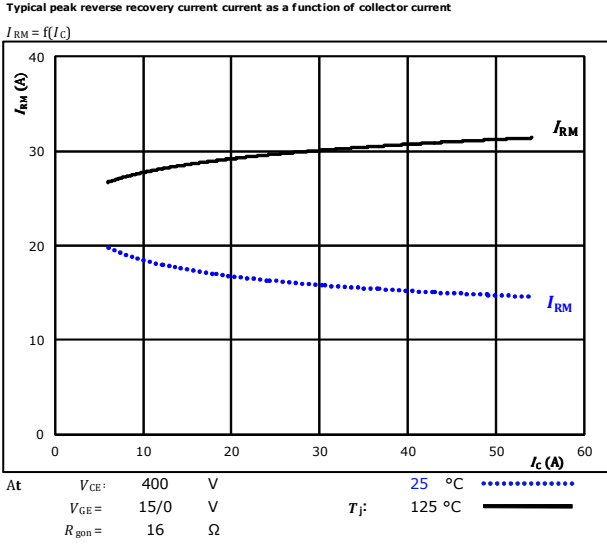
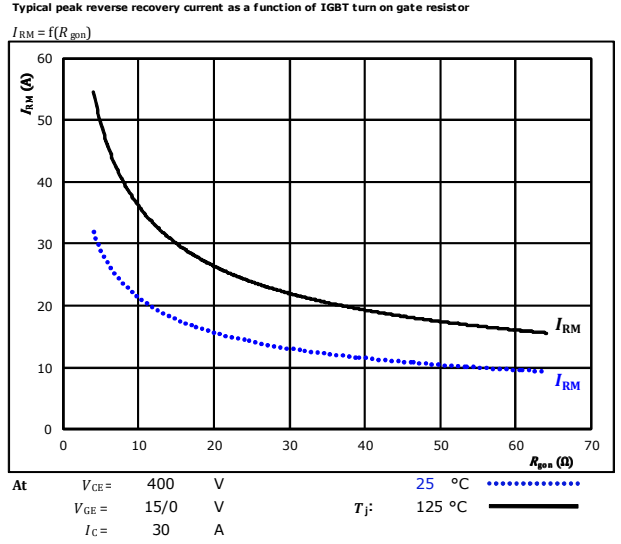


Figure 12. FWD
Typical peak reverse recovery current as a function of IGBT turn on gate resistor



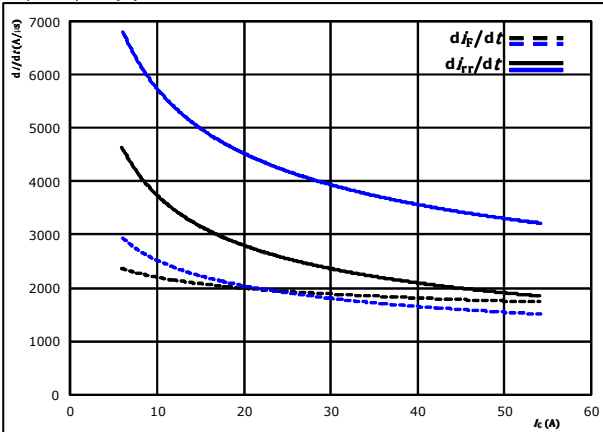


PFC Switching Characteristics

Figure 13. FWD

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

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

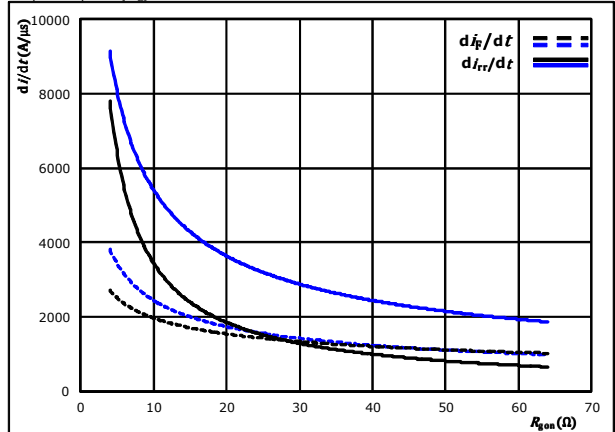


At $V_{CE} = 400$ V
 $V_{GE} = 15/0$ V
 $R_{gon} = 16$ Ω
 $T_j = 25$ °C
 $T_j = 125$ °C

Figure 14. FWD

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

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

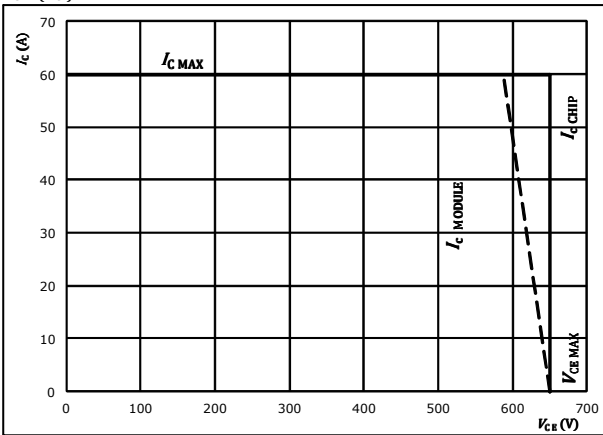


At $V_{CE} = 400$ V
 $V_{GE} = 15/0$ V
 $I_C = 30$ A
 $T_j = 25$ °C
 $T_j = 125$ °C

Figure 15. IGBT

Reverse bias safe operating area

$$I_C = f(V_{CB})$$



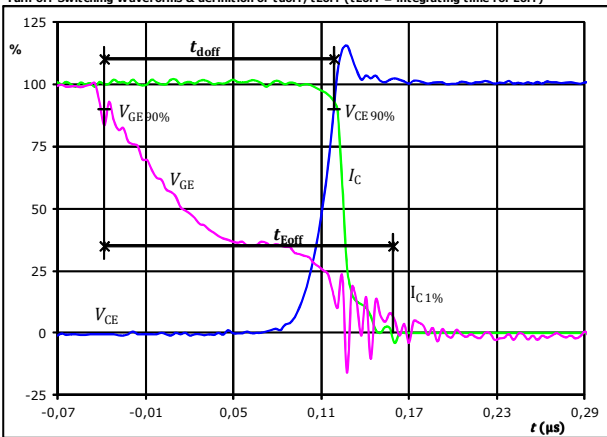
At $T_j = 175$ °C
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω



PFC Switching Definitions

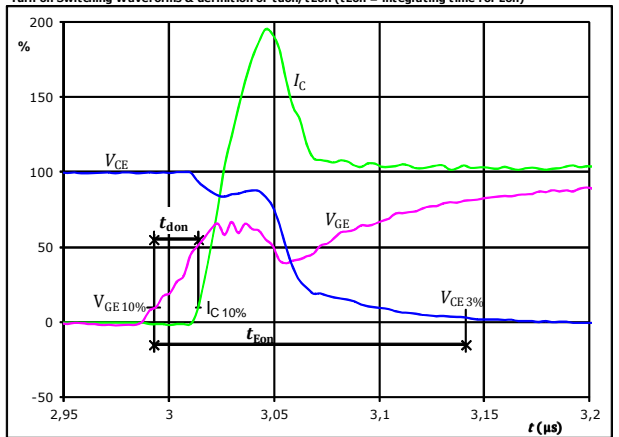
General conditions		
T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

Figure 1. IGBT
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for Eoff)



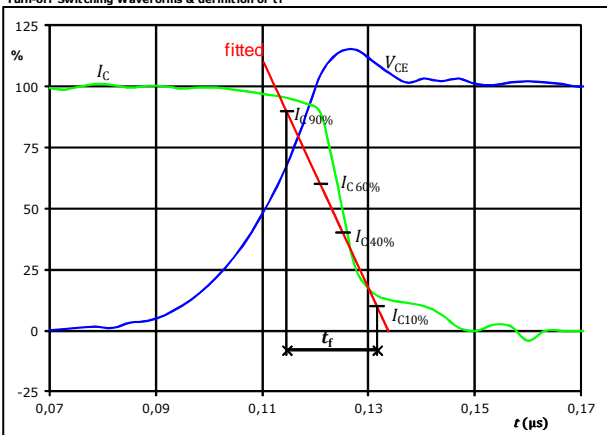
$V_{GE}(0\%) =$	0	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	400	V
$I_C(100\%) =$	30	A
$t_{doff} =$	0,159	μ s
$t_{Eoff} =$	0,197	μ s

Figure 2. IGBT
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for Eon)



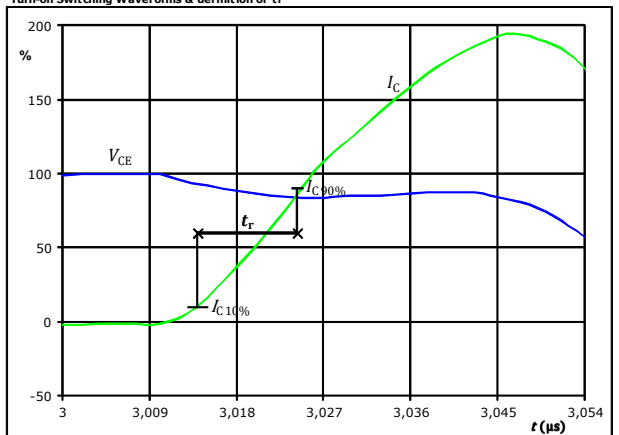
$V_{GE}(0\%) =$	0	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	400	V
$I_C(100\%) =$	30	A
$t_{don} =$	0,023	μ s
$t_{Eon} =$	0,148	μ s

Figure 3. IGBT
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	400	V
$I_C(100\%) =$	30	A
$t_f =$	0,007	μ s

Figure 4. IGBT
Turn-on Switching Waveforms & definition of t_r



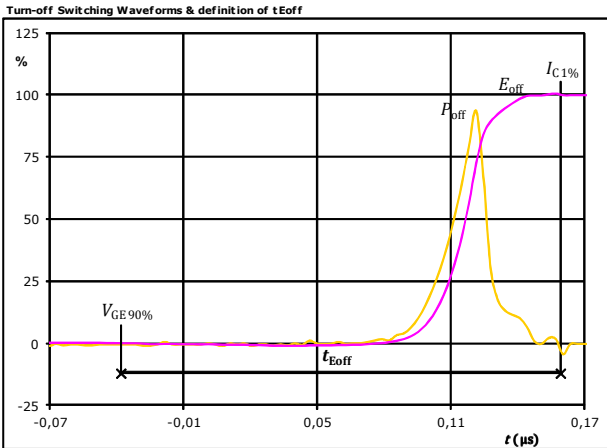
$V_C(100\%) =$	400	V
$I_C(100\%) =$	30	A
$t_r =$	0,011	μ s



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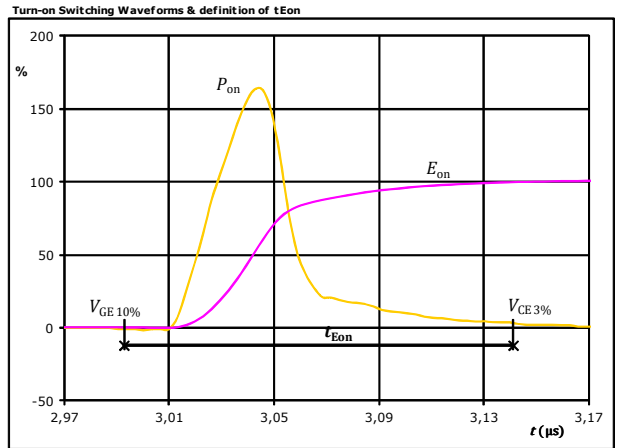
PFC Switching Definitions

Figure 5. IGBT



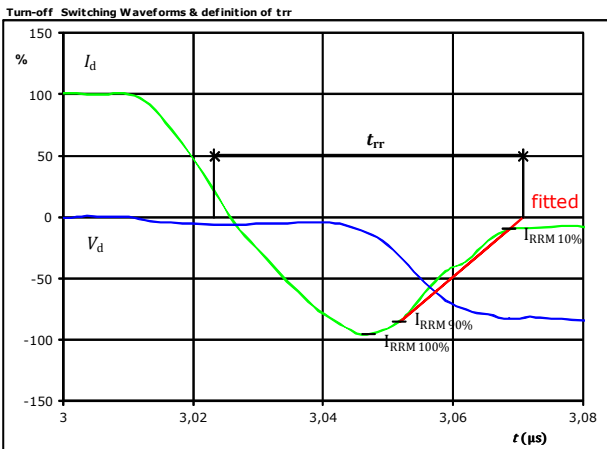
$P_{off}(100\%) =$	12,02	kW
$E_{off}(100\%) =$	0,23	mJ
$t_{Eoff} =$	0,20	μs

Figure 6. IGBT



$P_{on}(100\%) =$	12,02	kW
$E_{on}(100\%) =$	0,72	mJ
$t_{Eon} =$	0,15	μs

Figure 7. FWD

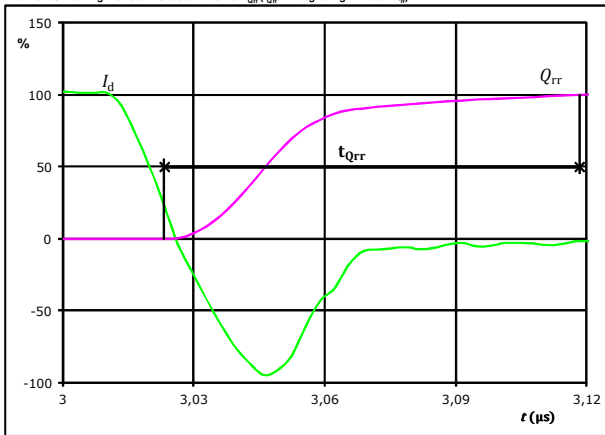


$V_d(100\%) =$	400	V
$I_d(100\%) =$	30	A
$I_{RRM}(100\%) =$	-28	A
$t_{tr} =$	0,045	μs



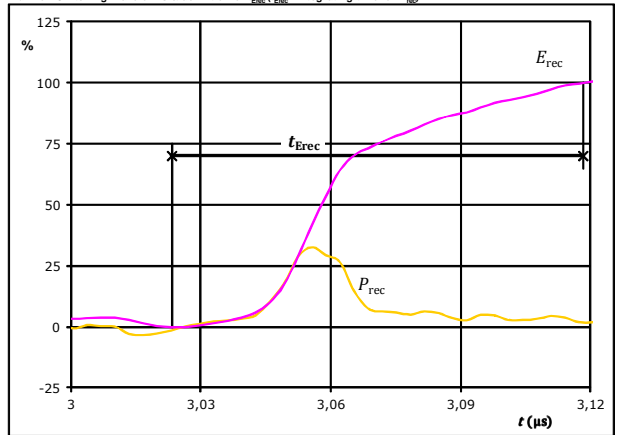
PFC Switching Definitions

Figure 8. FWD
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



$I_d(100\%) = 30 \text{ A}$
 $Q_{rr}(100\%) = 0,79 \text{ } \mu\text{C}$
 $t_{Qrr} = 0,09 \text{ } \mu\text{s}$


Figure 9. FWD
Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})

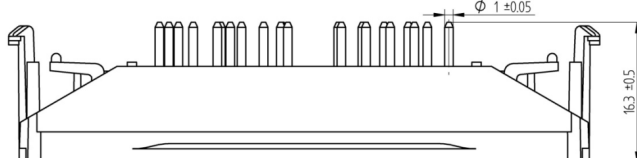
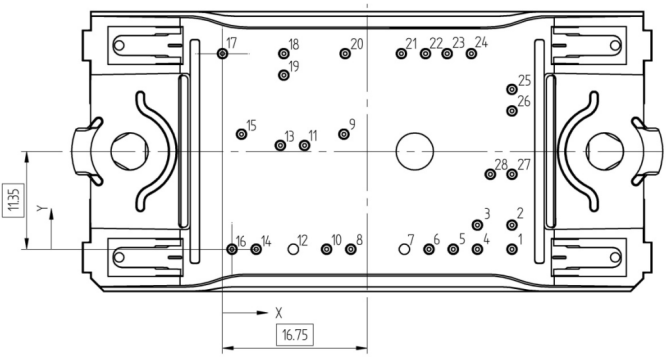


$P_{rec}(100\%) = 12,02 \text{ kW}$
 $E_{rec}(100\%) = 0,10 \text{ mJ}$
 $t_{Erec} = 0,09 \text{ } \mu\text{s}$



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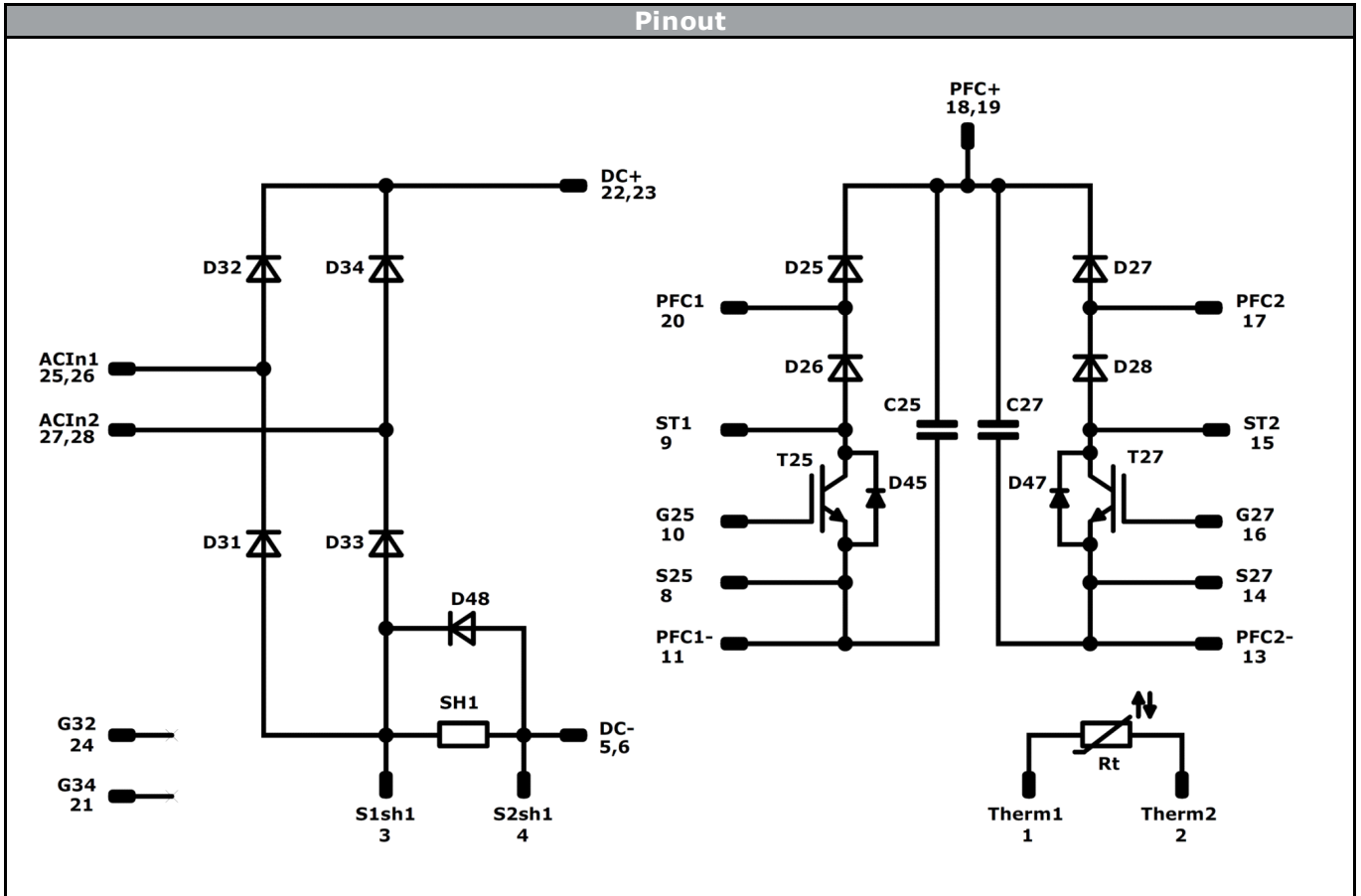
Ordering Code & Marking						
Version			Ordering Code			
without thermal paste with Solder pins 12mm housing			10-FZ062TA030SM-P986D13			
NN-NNNNNNNNNNNNNN TTTTTVV WWYY UL VIN LLLLL SSSS						
Text	Name		Date code	UL & Vinco	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTVV		WWYY	UL Vinco	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTVV	LLLLL	SSSS	WWYY		

Pin table [mm]				Outline	
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		

Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



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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	
D31, D32, D33, D34	Rectifier	1600 V	50 A	Rectifier Diode	
D48	FWD	1600 V	50 A	Shunt Protection Diode	
D26, D28	FWD	650 V	10 A	Current Transformer Protection Diode	
SH1	Shunt			Shunt Resistor	
C25, C27	Capacitor	1000 V		DC Link Capacitance	
Rt	NTC			Thermistor	



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Packaging instruction			
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ Sample
Handling instruction			
Handling instructions for <i>flow</i> 0 packages see vincotech.com website.			
General datasheet			
General datasheet for <i>flow</i> 0 packages see vincotech.com website.			
Package data			
Package data for <i>flow</i> 0 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
10-FZ062TA030SM-P986D13-D1-14	08 Mar. 2016		

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.