flow PFC 0

600 V/ 2 x (22 A & 165mOhm) / 100 kHz *PS

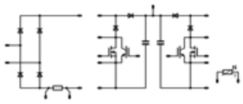
Features
- Vincotech clip-in housing
- Compact and low inductance design
- Suitable for Interleaved topology
- Suitable for curent sensing in collector or in emitter
- Parallel IGBT/MOSFET + SiC boost FRED

flow 0 housing

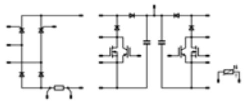
Target Applications
- PFC for welding
- PFC for SMPS
- PFC for motor drives
- PFC for UPS
- PFC for battery charger

Schematic

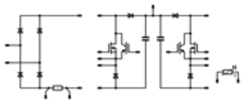
FZ062UA040FP



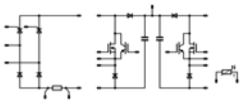
FZ062UA040FP01



FZ062UA040FP02



FZ062UA040FP03



Types
- FZ062UA040FP; without SCR, current sense in collector
- FZ062UA0404FP01; with SCR, current sense in collector
- FZ062UA040FP02; without SCR, current sense in emitter
- FZ062UA040FP03; with SCR, current sense in emitter

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Rectifier Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
DC forward current	I_F	$T_j=T_jmax$	T_h=80°C T_c=80°C	35	A
Surge forward current	I_{FSM}	t_p=10ms	T_j=25°C	250	A
I2t-value	I^2t			310	A^2s
Power dissipation per Diode	P_{tot}	$T_j=T_jmax$	T_h=80°C T_c=80°C	40	W
Maximum Junction Temperature	T_jmax			150	°C
Input Rectifier Thyristor					
Repetitive peak reverse voltage	V_{RRM}			800	V
DC forward current	I_F	$T_j=T_jmax$	T_h=80°C T_c=80°C	34	A
Surge forward current	I_{FSM}	t_p=10ms	T_j=25°C	250	A
I2t-value	I^2t			310	A^2s
Power dissipation per Thyristor	P_{tot}	$T_j=T_jmax$	T_h=80°C T_c=80°C	44	W
Maximum Junction Temperature	T_jmax			150	°C

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
PFC MOSFET					
Drain to source voltage	V_{DS}			600	V
DC drain current	I_D	$T_j=T_j$max	T_h=80°C T_c=80°C	11	A
Pulsed drain current	I_{Dpulse}	t_p limited by $T_j$max		61	A
Avalanche energy, single pulse	E_{AS}	I_D=11 A V_{DD}=50 V		800	mJ
Avalanche energy, repetitive	E_{AR}	I_D=11A V_{DD}=50V	t_{AR} limited by Tjmax	1.2	mJ
Avalanche current, repetitive	I_{AR}	t_p limited by Tjmax		11	A
dv/dt ruggedness	dv/dt	V_{DS}=0...480V		50	V/ns
Reverse diode dv/dt	dv/dt			15	V/ns
Power dissipation	P_{tot}	$T_j=T_j$max	T_h=80°C T_c=80°C	53	W
Gate-source peak voltage	V_{GS}			+/- 20	V
Maximum Junction Temperature	$T_j$max			150	°C
PFC IGBT					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	$T_j=T_j$max	T_h=80°C T_c=80°C	30	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by $T_j$max		280	A
Power dissipation per IGBT	P_{tot}	$T_j=T_j$max	T_h=80°C T_c=80°C	53	W
Gate-emitter peak voltage	V_{GE}			20	V
Maximum Junction Temperature	$T_j$max			150	°C
C.T. Inverse diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		600	V
DC forward current	I_F	$T_j=T_j$max	T_h=80°C T_c=80°C	8	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		16	A
Power dissipation per Diode	P_{tot}	$T_j=T_j$max	T_h=80°C T_c=80°C	14	W
Maximum Junction Temperature	$T_j$max			175	°C

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
PFC Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		600	V
DC forward current	I_F	$T_j=T_j max$	T_h=80°C T_c=80°C	20	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j max$		64	A
Power dissipation	P_{tot}	$T_j=T_j max$	T_h=80°C T_c=80°C	40	W
Maximum Junction Temperature	$T_j max$			600	°C
PFC Shunt					
DC forward current	I_F		T_c=25°C	31.6	A
Power dissipation per Shunt	P_{tot}		T_c=25°C	10	W
DC link Capacitor					
Max.DC voltage	V_{MAX}		T_c=25°C	500	V
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(Tjmax - 25)	°C
Insulation Properties					
Insulation voltage	V_{is}	t=2s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Input Rectifier Diode										
Forward voltage	V_F				30	Tj=25°C Tj=125°C		1.16 1.11	1.4	V
Threshold voltage (for power loss calc. only)	V_{to}				30	Tj=25°C Tj=125°C		0.9 0.77		V
Slope resistance (for power loss calc. only)	r_t				30	Tj=25°C Tj=125°C		9 12		mΩ
Reverse current	I_r			1500		Tj=25°C Tj=150°C			0.02 2	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ =1 W/mK						1.72		K/W
Input Rectifier Thyristor										
Forward voltage	V_F				30	Tj=25°C Tj=125°C		1.25 1.22	1.6	V
Threshold voltage (for power loss calc. only)	V_{to}				30	Tj=25°C Tj=125°C		0.93 0.82		V
Slope resistance (for power loss calc. only)	r_t				30	Tj=25°C Tj=125°C		0.011 0.014		mΩ
Reverse current	I_r			800		Tj=25°C Tj=125°C			0.05 2	mA
Gate controlled delay time	t_{GD}	Ig=0,5A dig/dt=0,5A/us		VD=1/2Vdrm		Tj=25°C			2	μs
Gate controlled rise time	t_{GR}	Ig=0,2A dig/dt=0,2A/us				Tj=25°C		<1		μs
Critical rate of rise of off-state voltage	(dv/dt)cr			VD=2/3Vdrm		Tj=125°C			500	V/μs
Critical rate of rise of on-state current	(di/dt)cr	Ig=0,2A f=50Hz		VD=2/3Vdrm	40	Tj=125°C			150	A/μs
Circuit commutated turn-off time	t_q	VD=2/3Vdrm tp=200us		100	26	Tj=125°C		150		μs
Holding current	I_H	VD=6V				Tj=25°C			50	mA
Latching current	I_L	tp=10us Ig=0,2A				Tj=25°C			90	mA
Gate trigger voltage	V_{GT}	VD=6V				Tj=25°C Tj=-40°C			1.3 1.6	V
Gate trigger current	I_{GT}	VD=6V				Tj=25°C Tj=-40°C	11		28 50	mA
Gate non-trigger voltage	V_{GD}			VD=1/2Vdrm		Tj=125°C			0.2	V
Gate non-trigger current	I_{GD}			VD=1/2Vdrm		Tj=125°C			1	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1.57		K/W
PFC MOSFET										
Avalanche breakdown voltage	$V_{(BR)DS}$		0		0.00025	Tj=25°C	600			V
Static drain to source ON resistance	$R_{DS(on)}$					Tj=25°C Tj=125°C			?	mΩ
Gate threshold voltage	$V_{(GS)th}$		Vds		0.00079	Tj=25°C Tj=125°C	2.5	3	3.9	V
Gate to Source Leakage Current	I_{GSS}		20	0		Tj=25°C Tj=125°C			0.2	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	600		Tj=25°C Tj=125°C			50	uA
Turn On Delay Time	$t_{d(ON)}$	Rgoff=4 Ω Rgon=4 Ω	15	400	20	Tj=25°C Tj=125°C		17.4 16.8		ns
Rise Time	t_r					Tj=25°C Tj=125°C		3 3.4		
Turn off delay time	$t_{d(OFF)}$					Tj=25°C Tj=125°C		223 242.2		
Fall time	t_f					Tj=25°C Tj=125°C		12.6 4.3		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		0.0563 0.066		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		0.132 0.1382		
Total gate charge	Q_{GE}	f=1MHz	10	400	12	Tj=25°C Tj=125°C		39		nC
Gate to source charge	Q_{GS}					Tj=25°C Tj=125°C		9		
Gate to drain charge	Q_{GD}					Tj=25°C Tj=125°C		13		
Input capacitance	C_{iss}	f=1MHz	0	100		Tj=25°C Tj=125°C		2000		pF
Output capacitance	C_{oss}					Tj=25°C Tj=125°C		100		
Reverse transfer capacitance	C_{rss}					Tj=25°C Tj=125°C		tbd		
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1.32		K/W

Characteristic Values

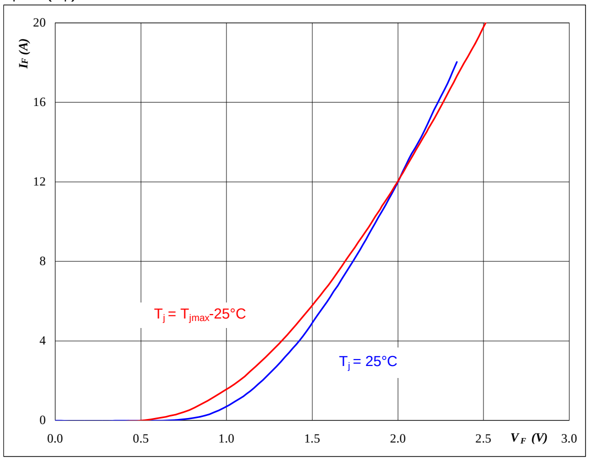
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
PFC IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$			Vge	0.00025	Tj=25°C Tj=125°C	4.5	5.5	7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$				20	Tj=25°C Tj=125°C		1.84	2.8	V
Collector-emitter cut-off	I_{CES}			0	600	Tj=25°C Tj=125°C			50	mA
Gate-emitter leakage current	I_{GES}			20	0	Tj=25°C Tj=125°C			0.3	nA
Integrated Gate resistor	R_{gint}							n.a.		Ω
Turn-on delay time	$t_{d(on)}$					Tj=25°C Tj=125°C		17.8 16.6		
Rise time	t_r					Tj=25°C Tj=125°C		3 3.4		ns
Turn-off delay time	$t_{d(off)}$	Rgoff=4 Ω Rgon=4 Ω	15	400	20	Tj=25°C Tj=125°C		217 243.4		
Fall time	t_f					Tj=25°C Tj=125°C		6.6 2.7		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		0.1035 0.2192		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		0.1366 0.1684		
Input capacitance	C_{ies}							2250		
Output capacitance	C_{oss}	f=1MHz	c	25		Tj=25°C		190		pF
Reverse transfer capacitance	C_{rss}							95		
Gate charge	Q_{Gate}		15	300	20	Tj=25°C		142	162	nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1.32		K/W
C.T. Inverse diode										
Diode forward voltage	V_F					Tj=25°C Tj=125°C		1.66 1.61		V
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						5.12		K/W
PFC Diode										
Forward voltage	V_F				16	Tj=25°C Tj=150°C		1.49 1.69		V
Reverse recovery time	I_{rm}	Rgoff=4 Ω				Tj=25°C Tj=150°C		7.2 7.6		μA
Peak recovery current	I_{RRM}					Tj=25°C Tj=150°C		27.001 24.724		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=150°C		7.2 7.6		ns
Reverse recovery charge	Q_{rr}	Rgoff=4 Ω	15	400	20	Tj=25°C Tj=150°C		0.1496 0.1407		μC
Reverse recovered energy	E_{rec}					Tj=25°C Tj=150°C		0.0374 0.0334		mWs
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=150°C		10652 9079		A/μs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						2.39		K/W
PFC Shunt										
R1 value	R						9.4	10	10.6	mΩ
Temperature coeficient	t_c	20°C to 60°C						< 50		ppm/K
Internal heat resistance	R_{thi}							< 6.5		K/W
Inductance	L							< 3		nH
DC link Capacitor										
C value	C						480	540	600	nF
Thermistor										
Rated resistance	R					Tj=25°C		22		kΩ
Deviation of R100	ΔR/R	R25=22 KΩ				Tj=100°C	-5		5	%
Power dissipation	P					Tj=25°C			210	mW
Power dissipation constant						Tj=25°C		3.5		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				Tj=25°C		3940		K
B-value	$B_{(25/100)}$	Tol. ±3%				Tj=25°C		4000		K

C.T. Inverse Diode

Figure 1 Inverse diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$

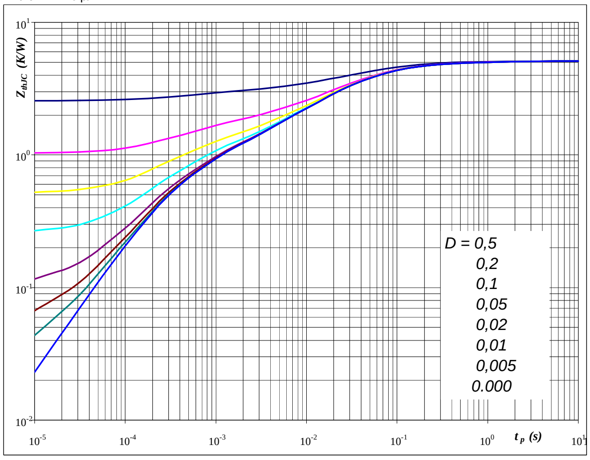


t_p = 250 µs

Figure 2 Inverse diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



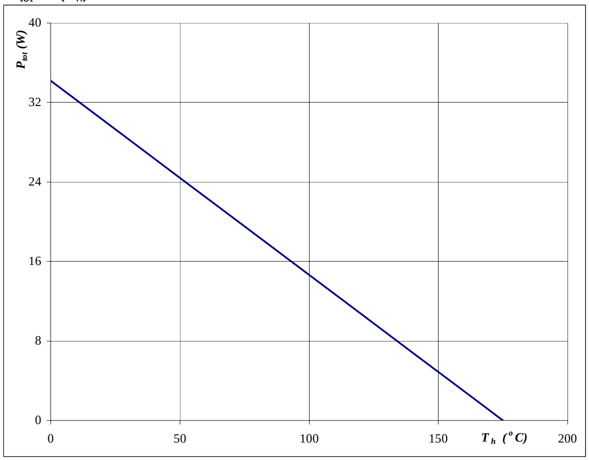
D = tp / T

R_{thJH} = 5.12 K/W

Figure 3 Inverse diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

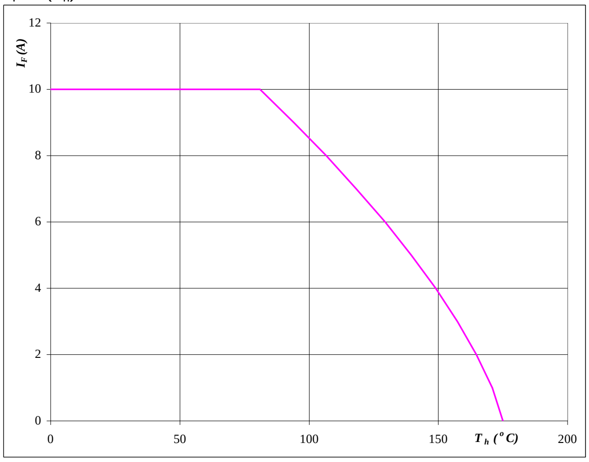


T_j = 175 ºC

Figure 4 Inverse diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



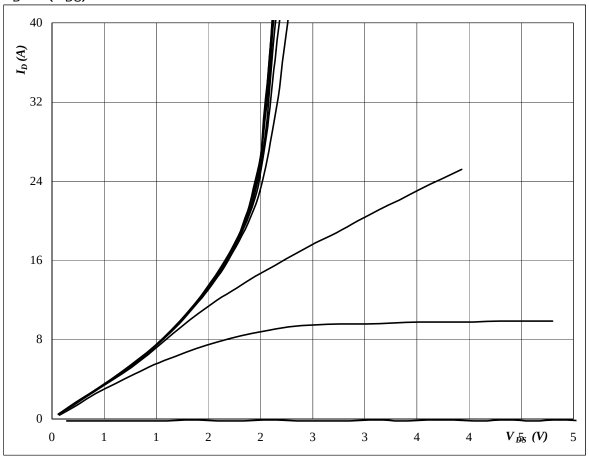
T_j = 175 ºC

PFC

Figure 1 PFC SWITCH

Typical output characteristics

$I_D = f(V_{DS})$

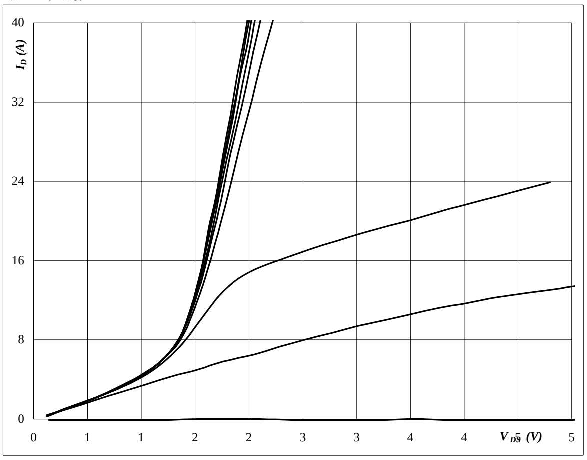


t_p = 250 μs
T_j = 25 °C
V_{GS} from 3 V to 19 V in steps of 2 V

Figure 2 PFC SWITCH

Typical output characteristics

$I_D = f(V_{DS})$

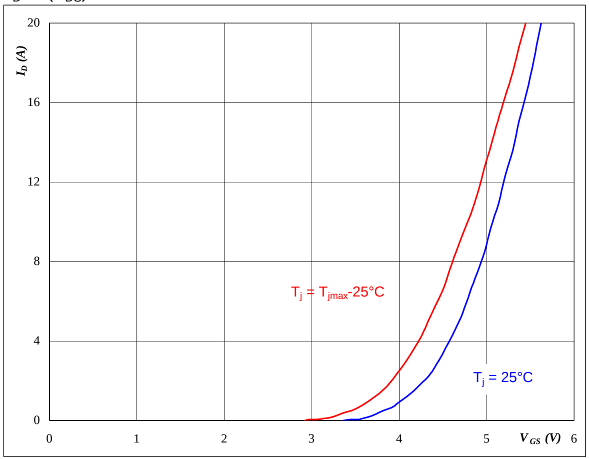


t_p = 250 μs
T_j = 125 °C
V_{GS} from 3 V to 19 V in steps of 2 V

Figure 3 PFC SWITCH

Typical transfer characteristics

$I_D = f(V_{DS})$

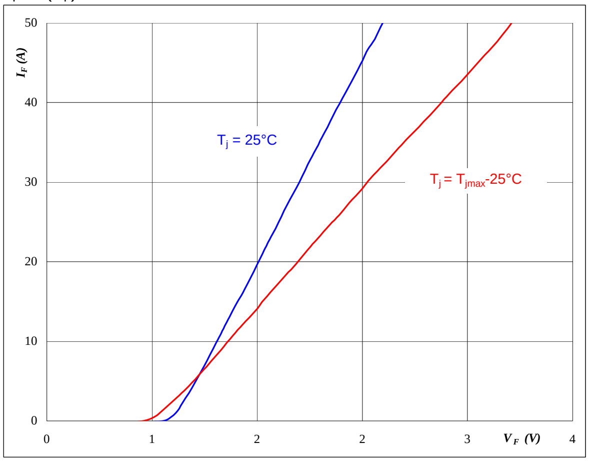


t_p = 250 μs
V_{DS} = 10 V

Figure 4 PFC FRED

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



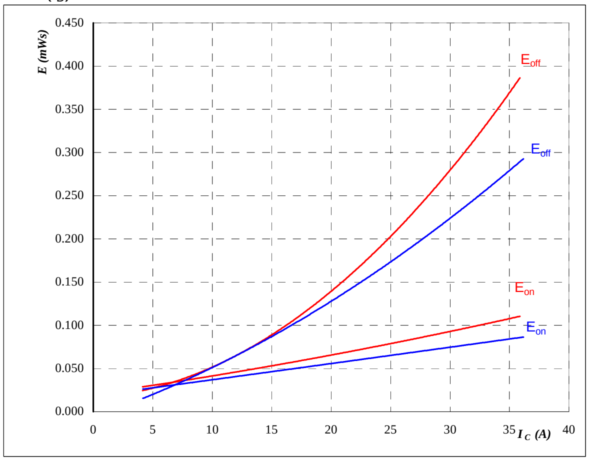
t_p = 250 μs

PFC

Figure 5 PFC SWITCH

Typical switching energy losses
as a function of collector current

$E = f(I_D)$



inductive load

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

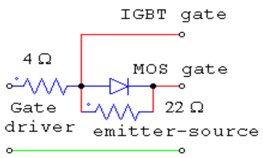
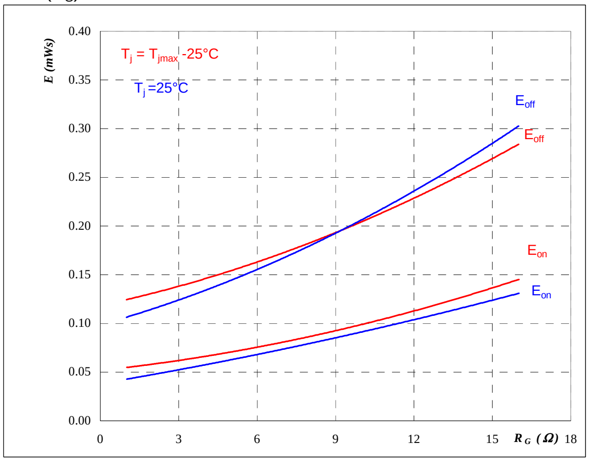


Figure 6 PFC SWITCH

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



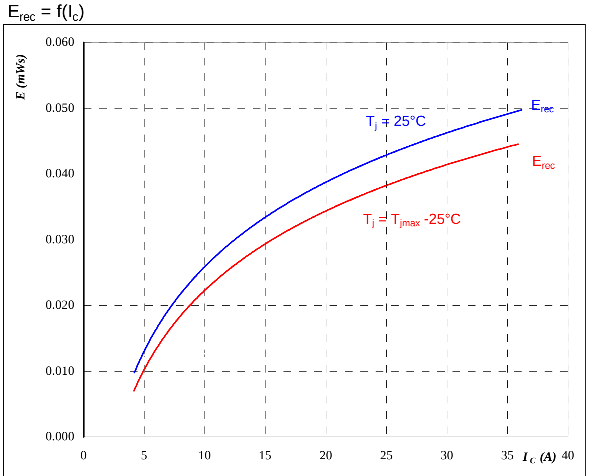
inductive load

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	15	V
I_D =	20	A

Figure 7 PFC FRED

Typical reverse recovery energy loss
as a function of collector (drain) current

$E_{rec} = f(I_c)$



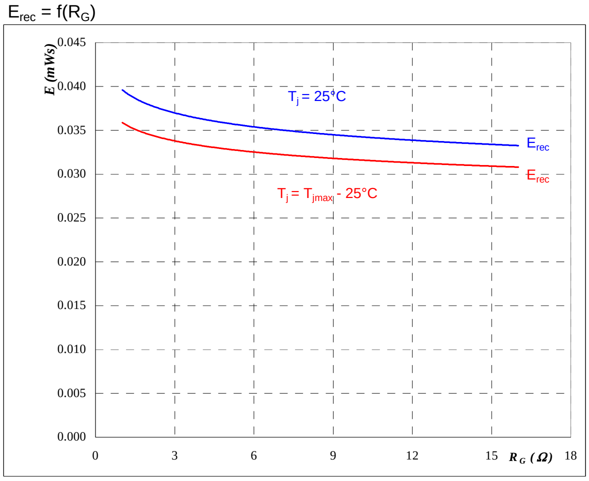
inductive load

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 8 PFC FRED

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



inductive load

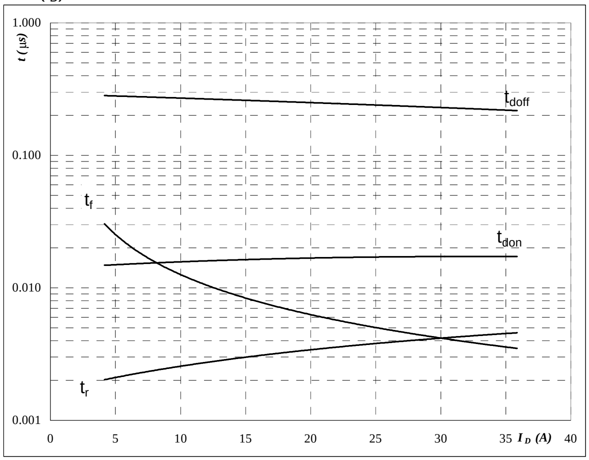
T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	15	V
I_D =	20	A

PFC

Figure 9 PFC SWITCH

Typical switching times as a function of collector current

$t = f(I_D)$



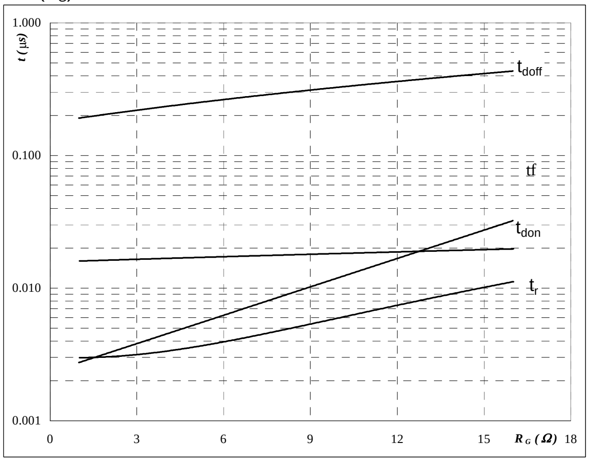
inductive load

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 10 PFC SWITCH

Typical switching times as a function of gate resistor

$t = f(R_G)$



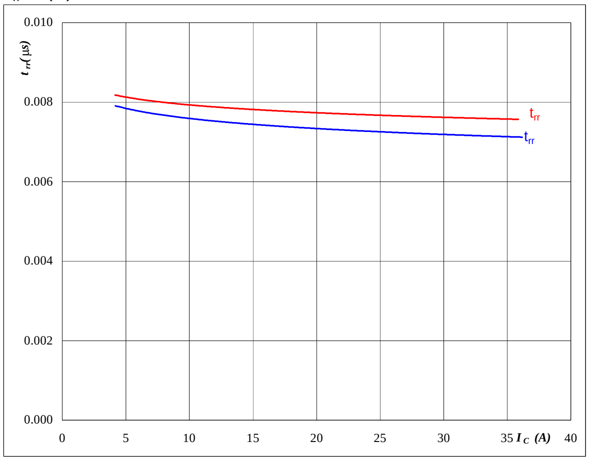
inductive load

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	15	V
I_C =	20	A

Figure 11 PFC FRED

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

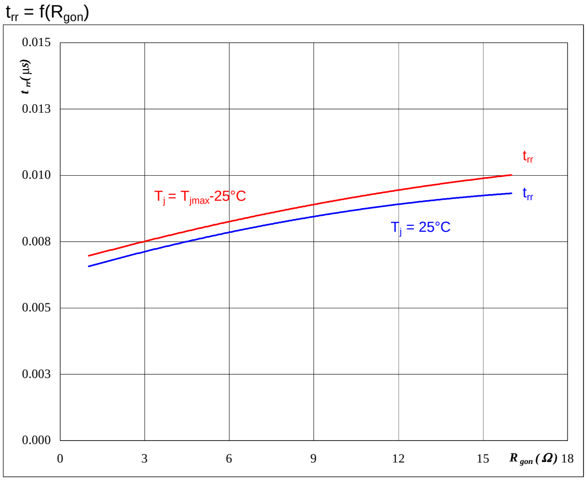


T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ω

Figure 12 PFC FRED

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

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



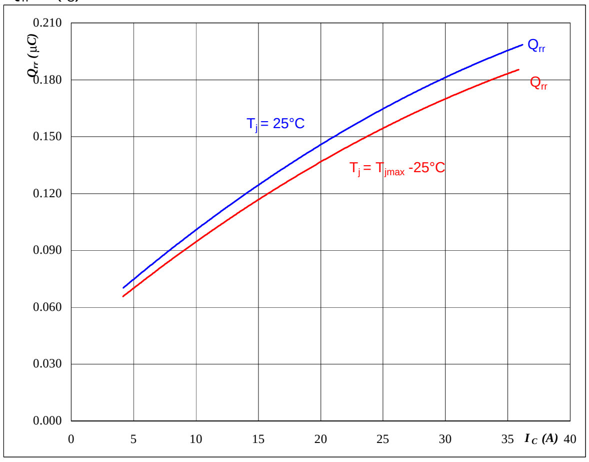
T_j =	25/125	°C
V_R =	400	V
I_F =	20	A
V_{GS} =	15	V

PFC

Figure 13 PFC FRED

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$

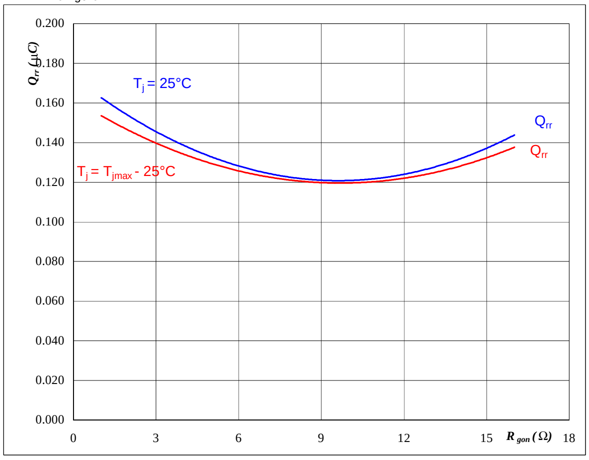


T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ω

Figure 14 PFC FRED

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

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

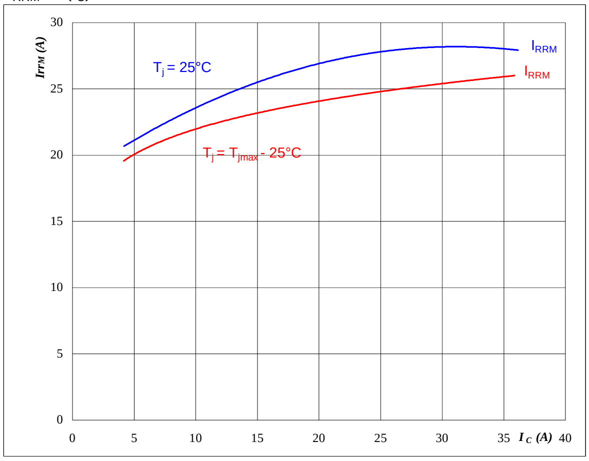


T_j =	25/125	°C
V_R =	400	V
I_F =	20	A
V_{GS} =	15	V

Figure 15 PFC FRED

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$

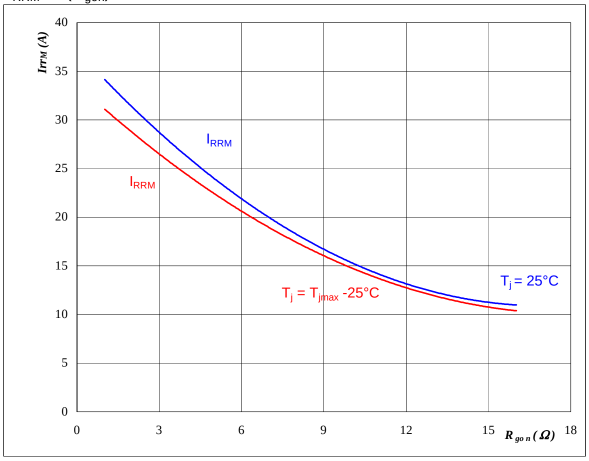


T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ω

Figure 16 PFC FRED

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

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



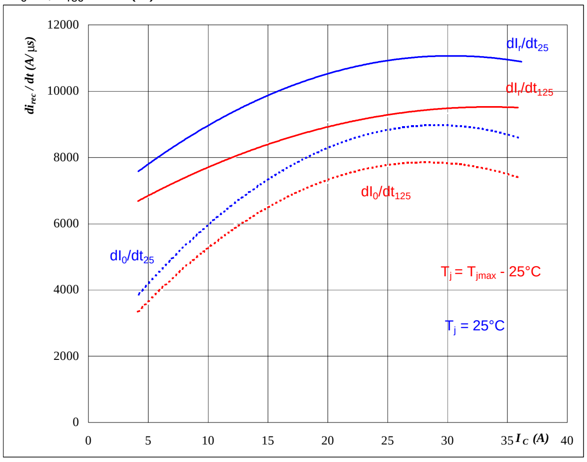
T_j =	25/125	°C
V_R =	400	V
I_F =	20	A
V_{GS} =	15	V

PFC

Figure 17	PFC FRED

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

$dI_0/dt, dI_{rec}/dt = f(I_c)$

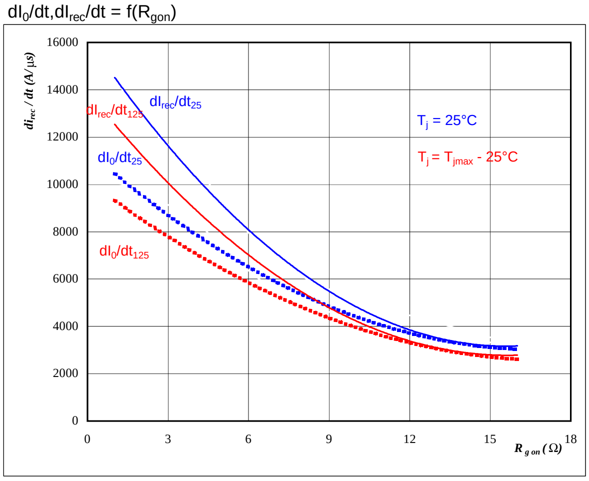


T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ω

Figure 18	PFC FRED

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

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$

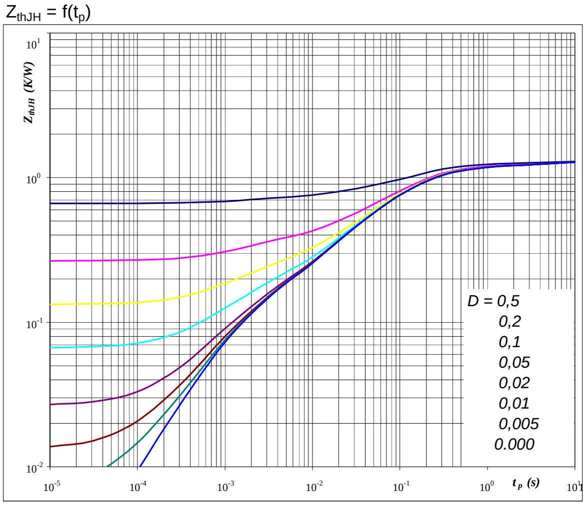


T_j =	25/125	°C
V_R =	400	V
I_F =	20	A
V_{GS} =	15	V

Figure 19	PFC IGBT

IGBT/MOSFET transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



D =	t_p / T	
R_{thJH} =	1.32	K/W

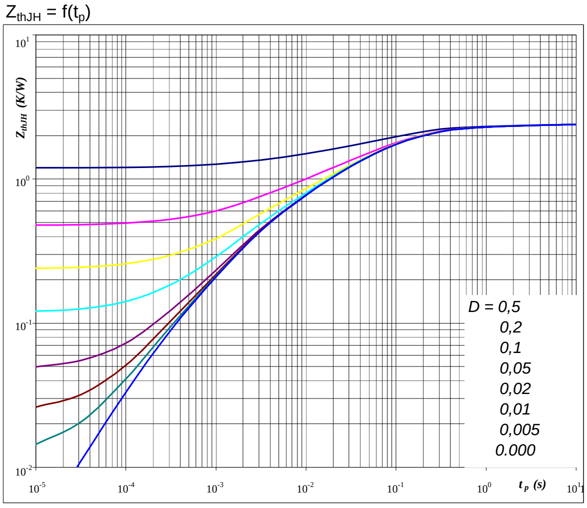
IGBT thermal model values

R (C/W)	Tau (s)
0.133	1.00E+01
0.256	4.43E-01
0.653	9.66E-02
0.182	1.56E-02
0.100	1.29E-03

Figure 20	PFC FRED

FRED transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



D =	t_p / T	
R_{thJH} =	2.39	K/W

FRED thermal model values

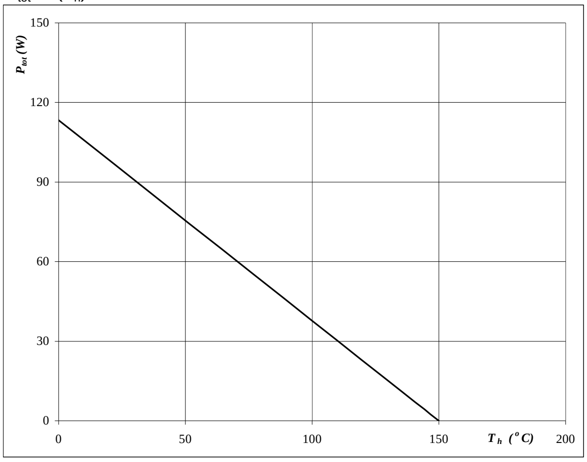
R (C/W)	Tau (s)
0.08	3.85E+00
0.28	4.94E-01
1.04	8.90E-02
0.60	1.64E-02
0.33	2.44E-03
0.05	2.92E-04

PFC

Figure 21 PFC IGBT/MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

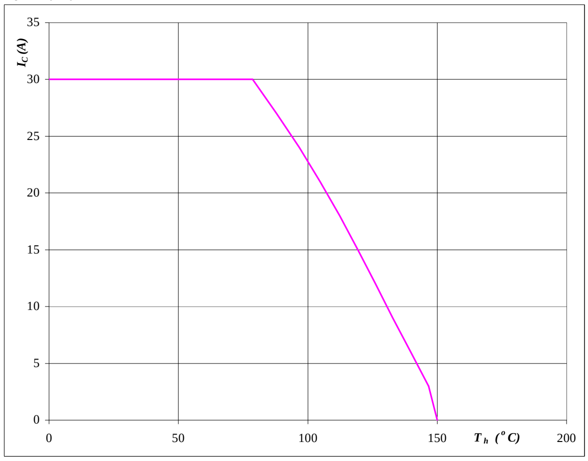


T_j = 150 ºC

Figure 22 PFC IGBT/MOSFET

Collector/Drain current as a function of heatsink temperature

$I_C = f(T_h)$

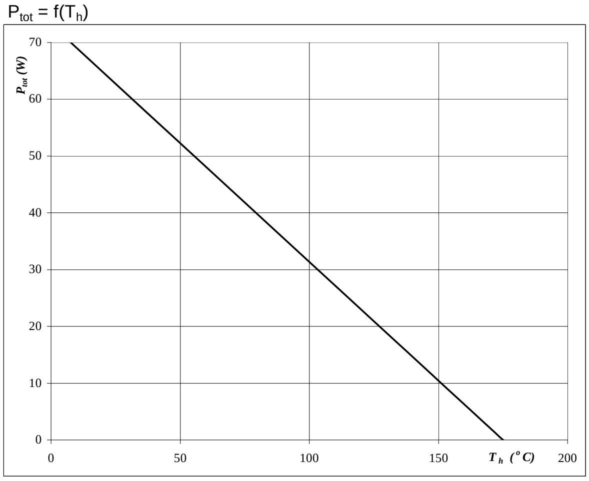


T_j = 150 ºC
V_{GS} = 15 V

Figure 23 PFC FRED

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

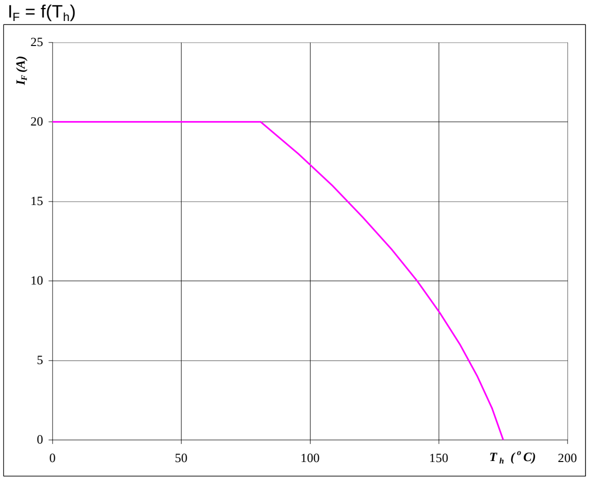


T_j = 175 ºC

Figure 24 PFC FRED

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



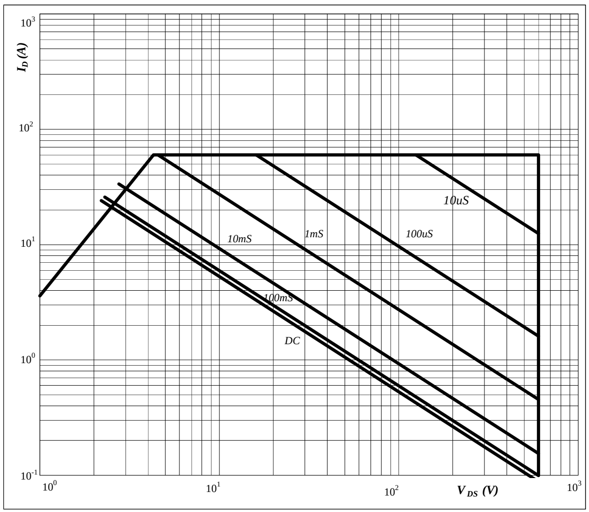
T_j = 175 ºC

PFC

Figure 25 PFC MOSFET

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



D = single pulse

T_h = 80 ºC

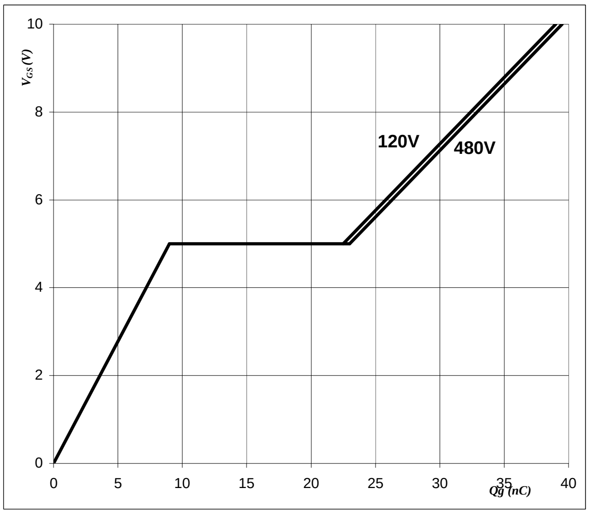
V_{GS} = 15 V

T_j = T_{jmax} ºC

Figure 26 PFC MOSFET

Gate voltage vs Gate charge

$V_{GS} = f(Qg)$



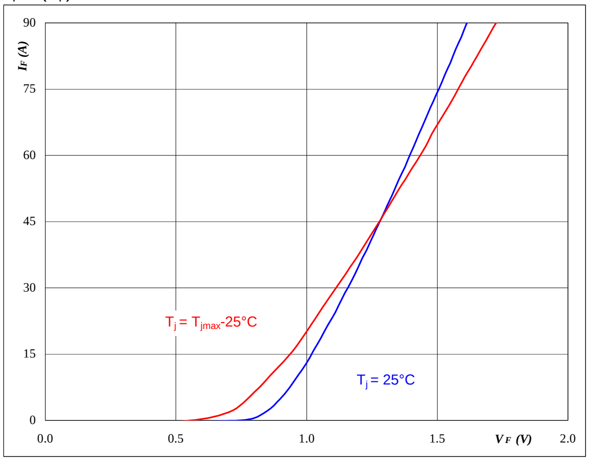
I_D = 20 A

Input Rectifier Bridge

Figure 1 Rectifier diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$

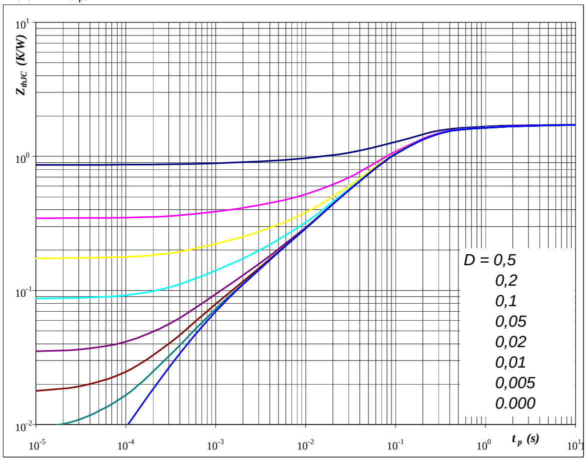


t_p = 250 µs

Figure 2 Rectifier diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



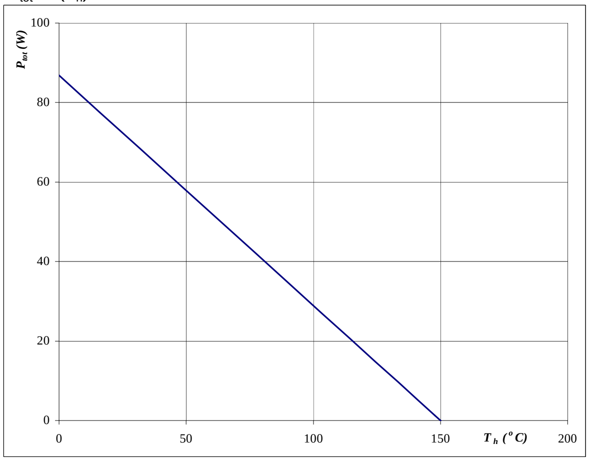
D = t_p / T

R_{thJH} = 1.73 K/W

Figure 3 Rectifier diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

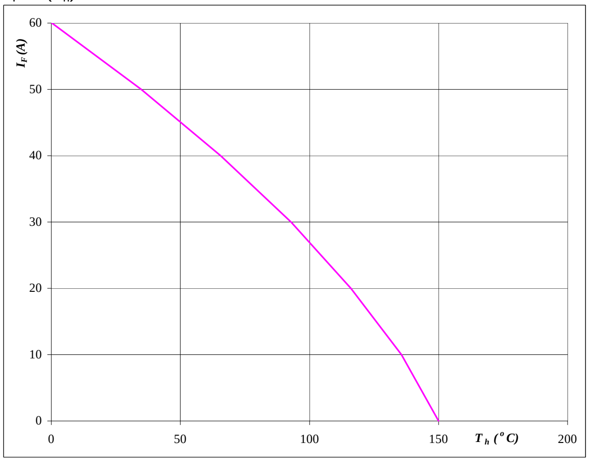


T_j = 150 ºC

Figure 4 Rectifier diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



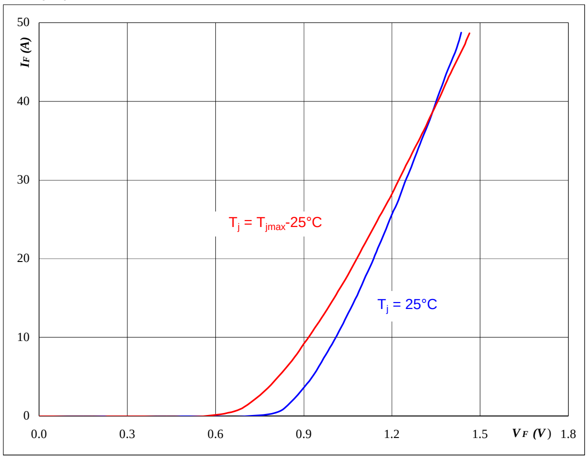
T_j = 150 ºC

Thyristor

Figure 1 Thyristor

Typical thyristor forward current as a function of forward voltage

$I_F = f(V_F)$

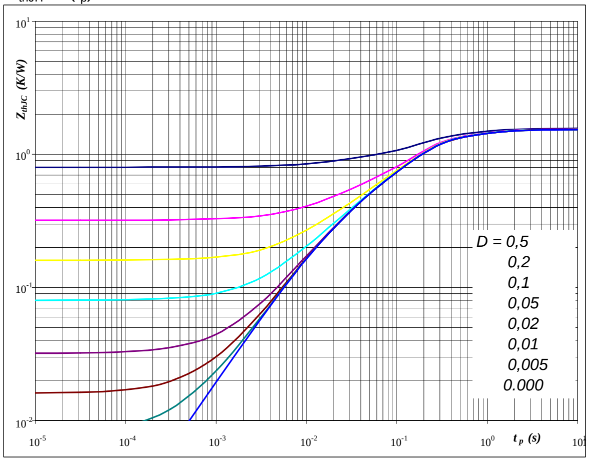


t_p = 250 µs

Figure 2 Thyristor

Thyristor transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



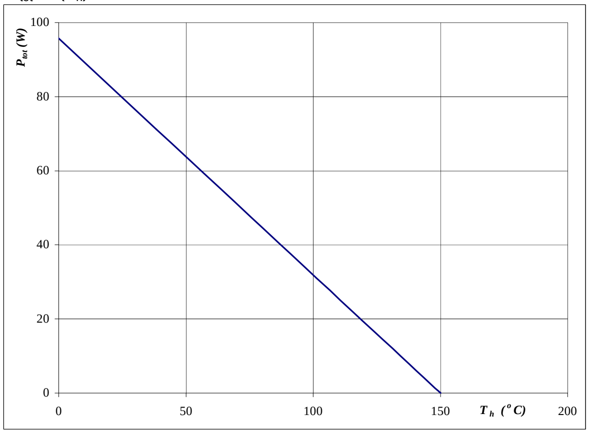
D = t_p / T

R_{thJH} = 1.57 K/W

Figure 3 Thyristor

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

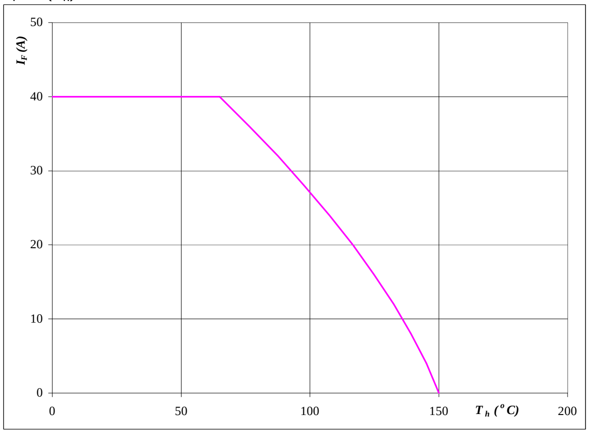


T_j = 150 ºC

Figure 4 Thyristor

Forward current as a function of heatsink temperature

$I_F = f(T_h)$

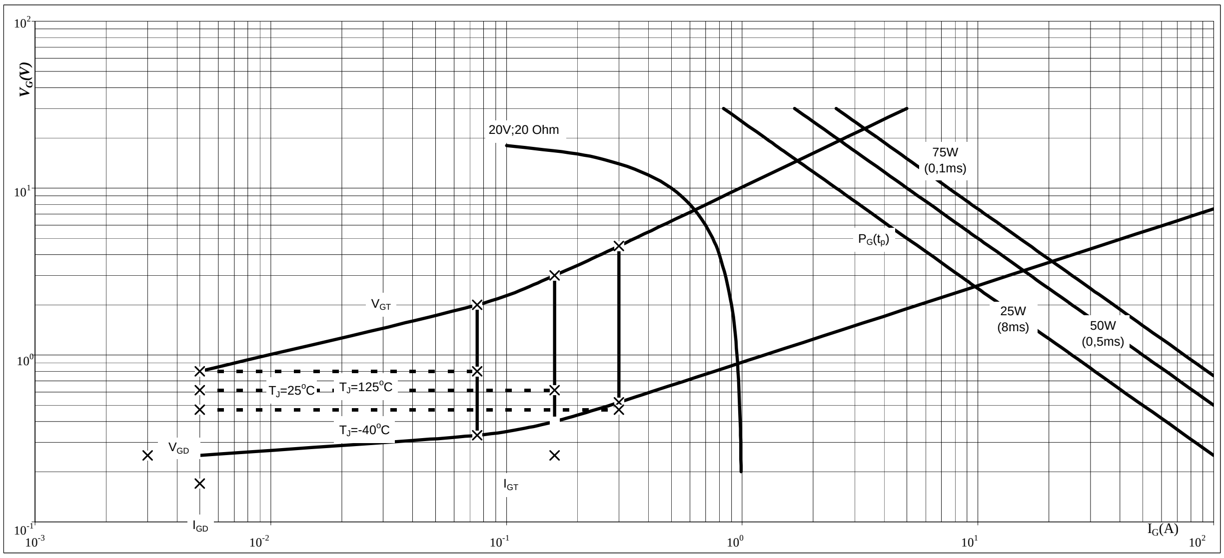


T_j = 150 ºC

Thyristor

Figure 5 Thyristor

Gate trigger characteristics

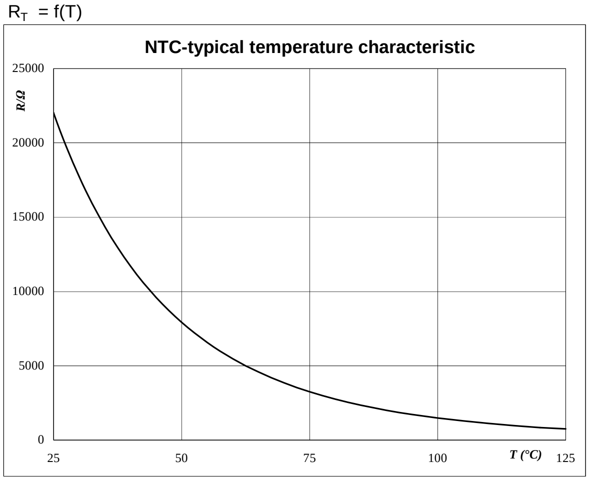


Thermistor

Figure 1 Thermistor

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$

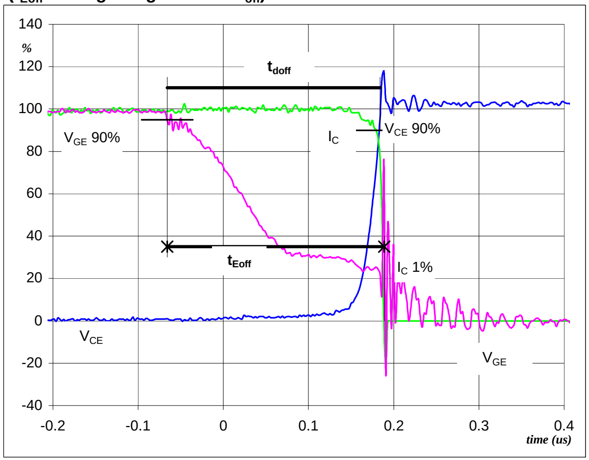


Switching Definitions PFC

General conditions		
T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

Figure 1 PFC MOSFET / IGBT

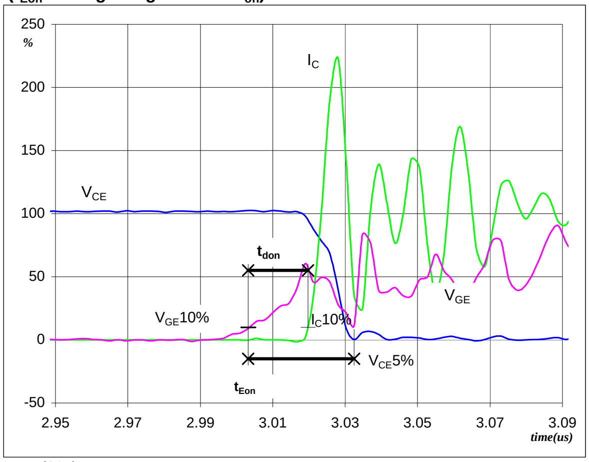
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	400	V
I_C (100%) =	20	A
t_{doff} =	0.24	µs
t_{Eoff} =	0.25	µs

Figure 2 PFC MOSFET / IGBT

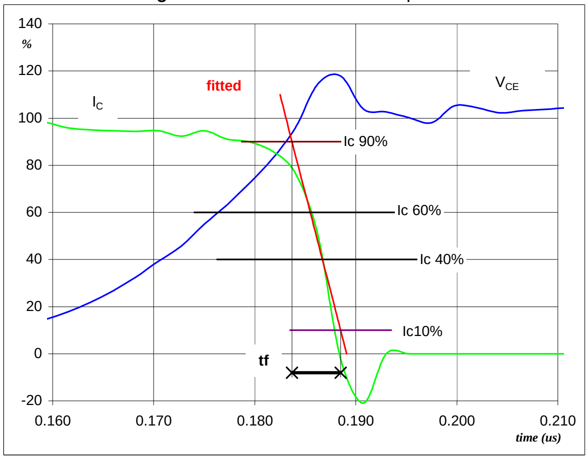
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	400	V
I_C (100%) =	20	A
t_{don} =	0.02	µs
t_{Eon} =	0.03	µs

Figure 3 PFC MOSFET / IGBT

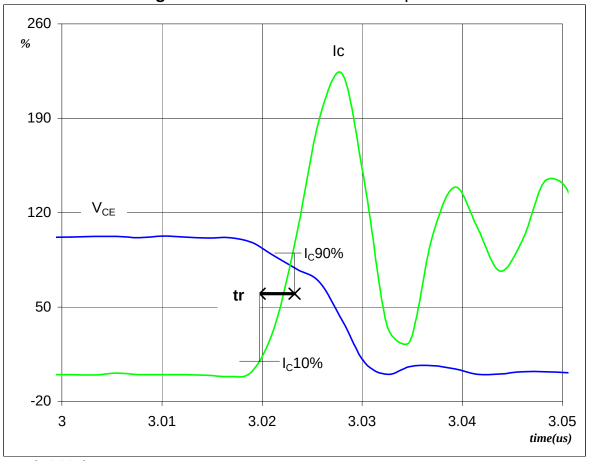
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	400	V
I_C (100%) =	20	A
t_f =	0.004	µs

Figure 4 PFC MOSFET / IGBT

Turn-on Switching Waveforms & definition of t_r

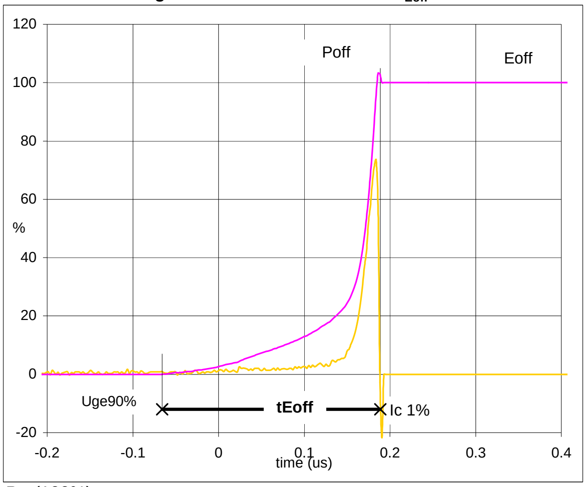


V_C (100%) =	400	V
I_C (100%) =	20	A
t_r =	0.003	µs

Switching Definitions PFC

Figure 5 PFC MOSFET / IGBT

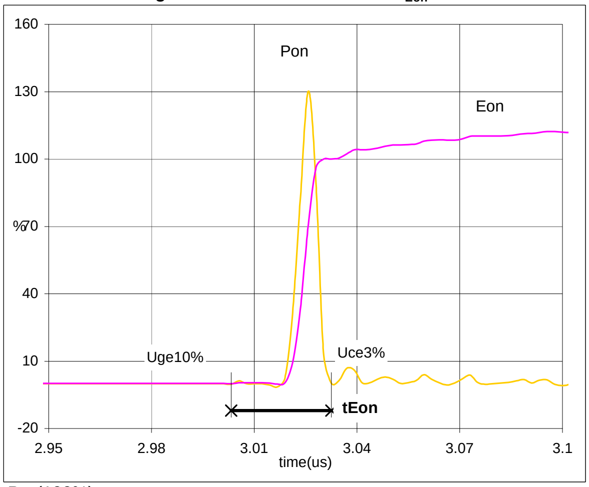
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	8.08	kW
E_{off} (100%) =	0.14	mJ
t_{Eoff} =	0.25	μs

Figure 6 PFC MOSFET / IGBT

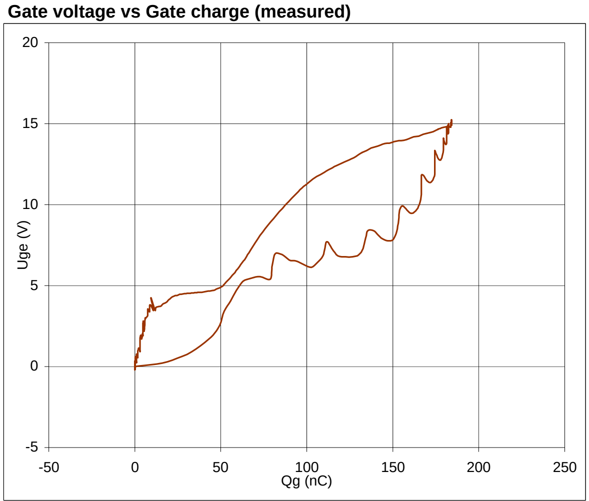
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	8.0764	kW
E_{on} (100%) =	0.07	mJ
t_{Eon} =	0.02925	μs

Figure 7 PFC MOSFET / IGBT

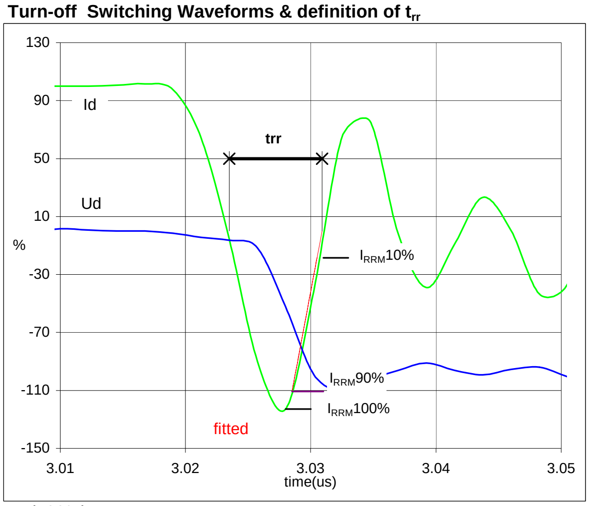
Gate voltage vs Gate charge (measured)



V_{GEoff} =	0	V
V_{GEon} =	15	V
V_C (100%) =	400	V
I_C (100%) =	20	A
Q_g =	184.16	nC

Figure 8 PFC FRED

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

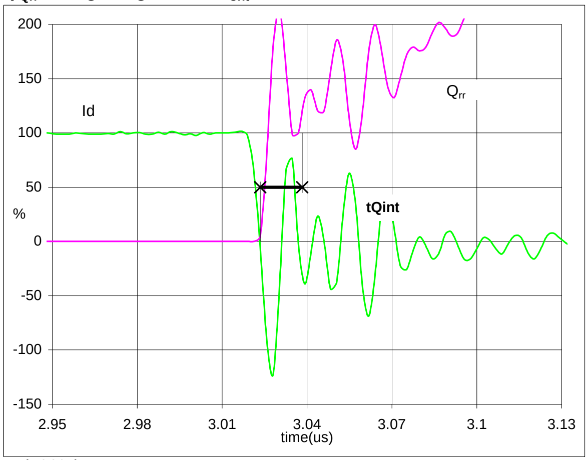


V_d (100%) =	400	V
I_d (100%) =	20	A
I_{RRM} (100%) =	-25	A
t_{rr} =	0.008	μs

Switching Definitions PFC

Figure 9 PFC FRED

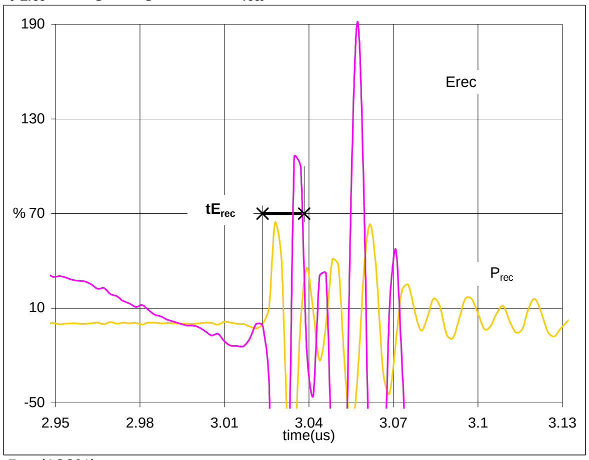
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



I_d (100%) =	20	A
Q_{rr} (100%) =	0.14	μC
t_{Qint} =	0.01	μs

Figure 10 PFC FRED

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



P_{rec} (100%) =	8.08	kW
E_{rec} (100%) =	0.03	mJ
t_{Erec} =	0.01	μs

Ordering Code and Marking - Outline - Pinout

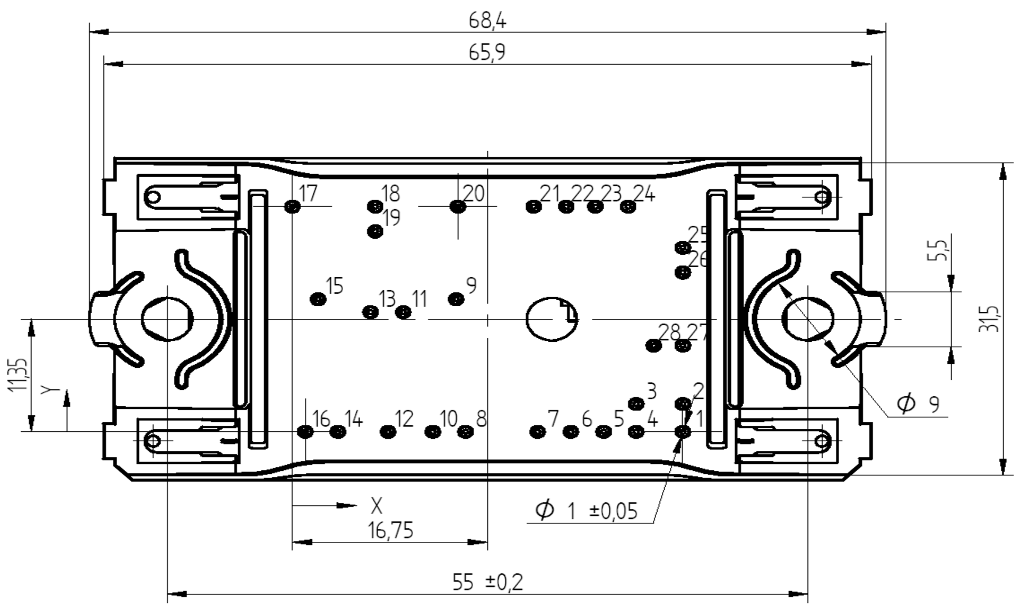
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without SCR, current sense in collector	10-FZ062UA0404FP-P982D18	P982D18	P982D18
with SCR, current sense in collector	10-FZ062UA040FP01-P982D28	P982D28	P982D28
without SCR, current sense in emitter	10-FZ062UA040FP02-P982D38	P982D38	P982D38
with SCR, current sense in emitter	10-FZ062UA040FP03-P982D48	P982D48	P982D48

Outline

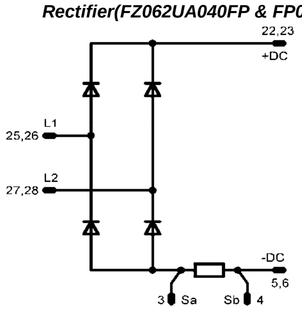
Pin table

Pin	X	Y
1	33,5	0
2	33,5	2,8
3	29,5	2,8
4	29,5	0
5	26,7	0
6	23,9	0
7	21,05	0
8	14,85	0
9	14,05	13,35
10	12,05	0
11	9,5	12,05
12	8,2	0
13	6,7	12,05
14	3,9	0
15	2,2	13,35
16	1,1	0
17	0	22,7
18	7,1	22,7
19	7,1	20,2
20	14,2	22,7
21	20,7	22,7
22	23,5	22,7
23	26	22,7
24	28,8	22,7
25	33,5	18,55
26	33,5	16,05
27	33,5	8,7
28	31	8,7

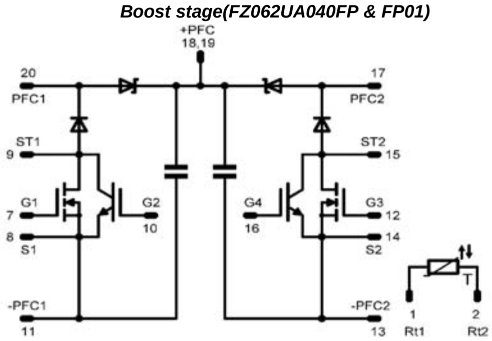


Pinout

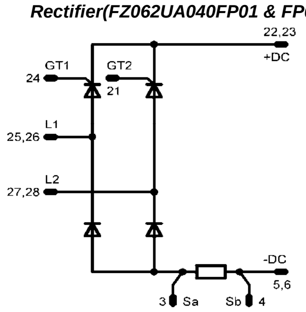
Rectifier(FZ062UA040FP & FP02)



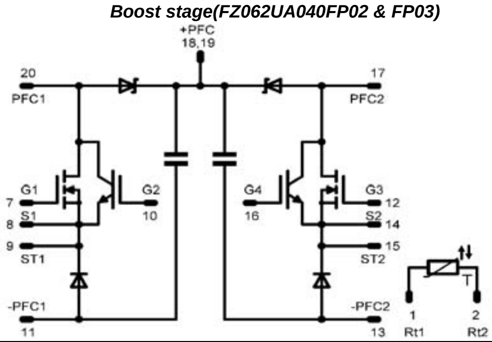
Boost stage(FZ062UA040FP & FP01)



Rectifier(FZ062UA040FP01 & FP03)



Boost stage(FZ062UA040FP02 & FP03)



PRODUCT STATUS DEFINITIONS

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

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.

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.