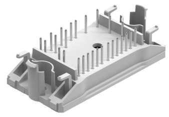
flow PIM0 + PFC 2nd — 600 V / 6 A

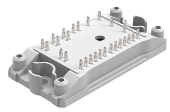
Features

- Clip in PCB mounting
- Trench Fieldstop IGBT's for low saturation losses
- Latest generation superjunction MOSFET for PFC

flow 0 housing



17mm housing solder pins

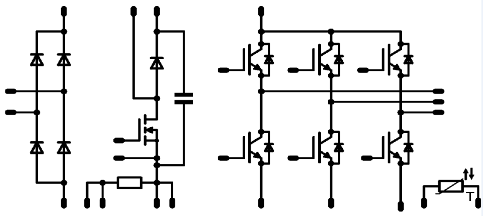


12mm housing Press-fit pins

Target Applications

- Industrial Drives
- Embedded Drives

Schematic



Types

- 10-F006PPA006SB-M682B
- 10-PC06PPA006SB-M682B06Y

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Rectifier Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
DC forward current	I_{FAV}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	34 35	A
Surge forward current	I_{FSM}	t_p = 10 ms	T_j = 150 °C	200	A
I2t-value	I^2t	t_p = 10 ms	T_j = 150 °C	200	A²s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	43 66	W
Maximum Junction Temperature	T_{jmax}			150	°C

Parameter	Symbol	Condition		Value	Unit
PFC Switch					
Drain to source breakdown voltage	V_{DS}			600	V
DC drain current	I_D	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	10 12	A
Pulsed drain current	I_{Dpulse}	t_p limited by T_{jmax}		59	A
Avalanche energy, single pulse	E_{AS}	I_D = 3,4 A V_{DD} = 50 V	T_j = 25 °C	418	mJ
Avalanche energy, repetitive	E_{AR}	I_D = 3,4 A V_{DD} = 50 V	T_j = 25 °C	0,63	mJ
Avalanche current, repetitive	I_{AR}		T_j = 25 °C	3,4	A
MOSFET dv/dt ruggedness	dv/dt			50	V/ns
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	53 81	W
Gate-source peak voltage	V_{GSS}			±20	V
Reverse diode dv/dt	dv/dt			15	V/ns
Maximum Junction Temperature	T_{jmax}			150	°C

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
PFC Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	8 8	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		18	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	45 68	W
Maximum Junction Temperature	T_{jmax}			175	°C
PFC Shunt					
DC forward current	I_F		T_c = 25 °C	10	A
Power dissipation per Shunt	P_{tot}		T_c = 25 °C	5	W
Inverter Switch					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	8 8	A
Pulsed collector current	I_{CRM}	t_p limited by T_{jmax}		18	A
Turn off safe operating area		V_{CE} ≤ 400 V, T_j ≤ T_{op} max		18	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	36 54	W
Gate-emitter peak voltage	V_{GE}			20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15V		6 360	μs V
Maximum Junction Temperature	T_{jmax}			175	°C
Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	8 8	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		12	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	27 41	W
Maximum Junction Temperature	T_{jmax}			175	°C
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…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{is}	t = 2 s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance		12 mm housing Press-fit pins 17 mm housing solder pins		9,16 min 12,7	mm
Comparative tracking index	CTI			>200	

Characteristic Values

Parameter	Symbol	Conditions	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 [°C]	Min	Typ	Max	Unit
Rectifier Diode										
Forward voltage	V_F				25	25 125		 1,17		V
Threshold voltage (for power loss calc. only)	V_{to}				25	25 125		0,92 0,81		V
Slope resistance (for power loss calc. only)	r_t				25	25 125		10,9 14,4		mΩ
Reverse current	I_r			1600		25			0.05	mA
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase - change material λ = 3,4 W/mK						1,61		K/W
PFC Switch										
Static drain to source ON resistance	$r_{DS(on)}$		10		6	25		203 398		mΩ
Gate threshold voltage	$V_{(GS)th}$	$V_{GS} = V_{DS}$			0,00063	25	2,4	3,0	3,6	V
Gate to Source Leakage Current	I_{GSS}		20	0		25			100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	600		25			1000	nA
Turn On Delay Time	$t_{d(on)}$	$R_{goff} = 4$ Ω $R_{gon} = 4$ Ω	10	400	6	25 125		17 16		ns
Rise Time	t_r					25 125		2 2		
Turn off delay time	$t_{d(off)}$					25 125		103 113		
Fall time	t_f					25 125		6 9		
Turn-on energy loss	E_{on}					25 125		0,045 0,091		mWs
Turn-off energy loss	E_{off}					25 125		0,006 0,007		
Total gate charge	Q_{GE}		0/10	480	9,5	25		63		nC
Gate to source charge	Q_{GS}							7,6		
Gate to drain charge	Q_{GD}							32		
Input capacitance	C_{iss}	f = 1 MHz	0	100		25		1400		pF
Output capacitance	C_{oss}							85		
Gate resistance	R_G							6		Ω
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase - change material λ = 3,4 W/mK						1,32		K/W
PFC Diode										
Forward voltage	V_F				6	25 125		2,83 1,66		V
Reverse leakage current	I_{rm}			600		25 125			50 500	μA
Peak recovery current	I_{RRM}	$R_{gon} = 4$ Ω	10	400	6	25 125		29 31		A
Reverse recovery time	t_{rr}					25 125		9 15		ns
Reverse recovery charge	Q_{rr}					25 125		0,12 0,29		μC
Reverse recovered energy	E_{rec}					25 125		0,013 0,042		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		12276 7905		A/μs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase - change material λ = 3,4 W/mK						2,10		K/W
PFC Shunt										
R1 value	R							50		mΩ
Temperature coeficient	t_c	20 °C to 60 °C							30	ppm/K
Internal heat resistance	R_{thi}								10	K/W
Inductance	L								3	nH

Characteristic Values

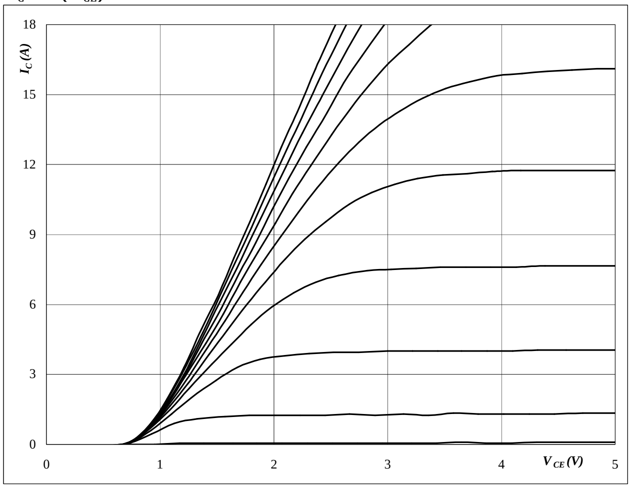
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j [°C]	Min	Typ	Max	
Inverter Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00009	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		6	25 125		1,52 1,71		V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		25			0,027	mA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$					25 125		103 101		
Rise time	t_r					25 125		23 26		ns
Turn-off delay time	$t_{d(off)}$	R_{goff} = 64 Ω R_{gon} = 64 Ω	±15	400	6	25 125		154 177		
Fall time	t_f					25 125		96 105		
Turn-on energy loss	E_{on}					25 125		0,19 0,25		mWs
Turn-off energy loss	E_{off}					25 125		0,21 0,27		
Input capacitance	C_{ies}							368		
Output capacitance	C_{oss}	f = 1 MHz	0	25		25		28		pF
Reverse transfer capacitance	C_{rss}							11		
Gate charge	Q_G		±15	480	6	25		42		nC
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase - change material λ = 3,4 W/mK						2,66		K/W
Inverter Diode										
Diode forward voltage	V_F				6	25 125	1,25	1,62 1,53	1,95	V
Peak reverse recovery current	I_{RRM}					25 125		3 4		A
Reverse recovery time	t_{rr}					25 125		236 341		ns
Reverse recovered charge	Q_{rr}	R_{gon} = 64 Ω	±15	400	6	25 125		0,32 0,60		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		12 30		A/µs
Reverse recovered energy	E_{rec}					25 125		0,09 0,17		mWs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase - change material λ = 3,4 W/mK						3,55		K/W
DC link Capacitor										
C value	C							100		nF
Thermistor										
Rated resistance	R					25		22000		Ω
Deviation of R100	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-5		5	%
Power dissipation	P					25		210		mW
Power dissipation constant						25		3,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25				K
B-value	$B_{(25/100)}$	Tol. ±3%				25		4000		K
Vincotech NTC Reference									A	

Inverter Characteristics

Figure 1 Inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



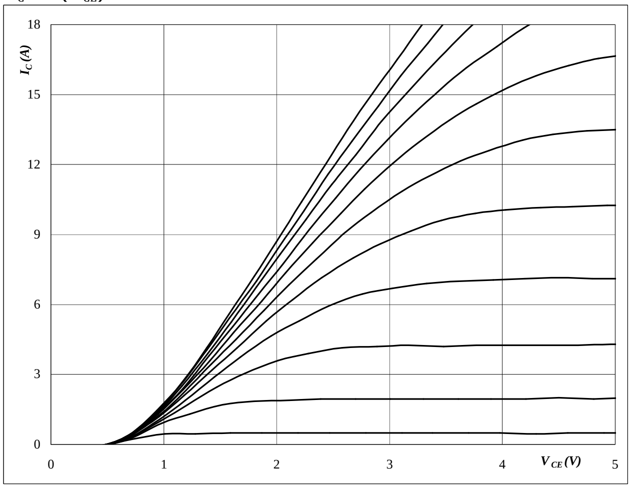
At

t_p =	250	μs
T_j =	25	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 2 Inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



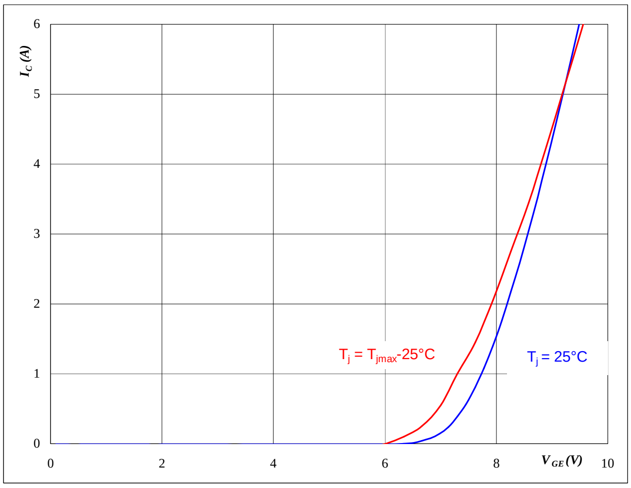
At

t_p =	250	μs
T_j =	125	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 3 Inverter IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



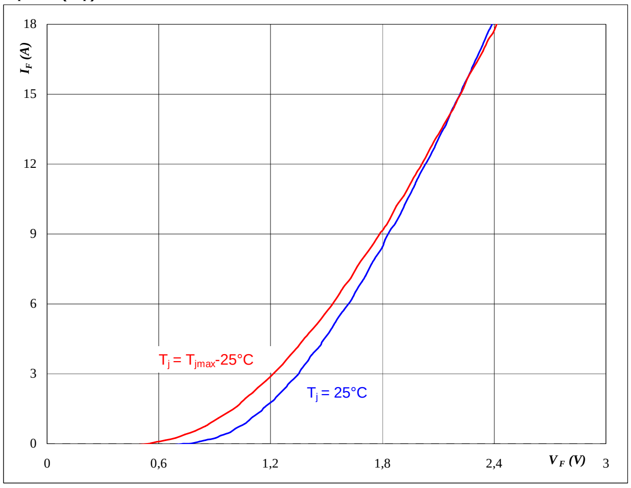
At

t_p =	250	μs
V_{CE} =	10	V

Figure 4 Inverter Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

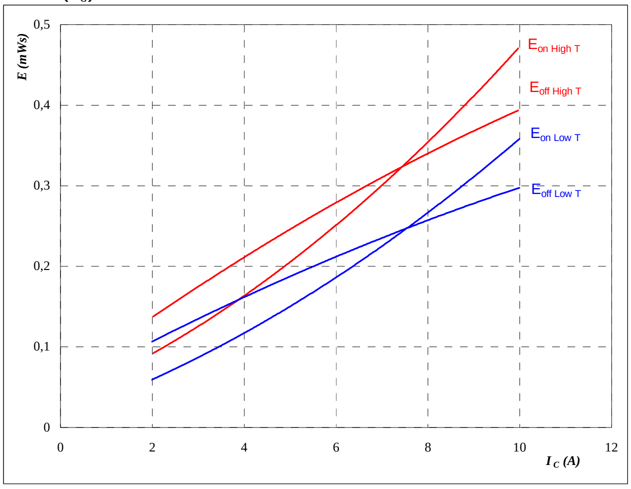
t_p =	250	μs

Inverter Characteristics

Figure 5 Inverter IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



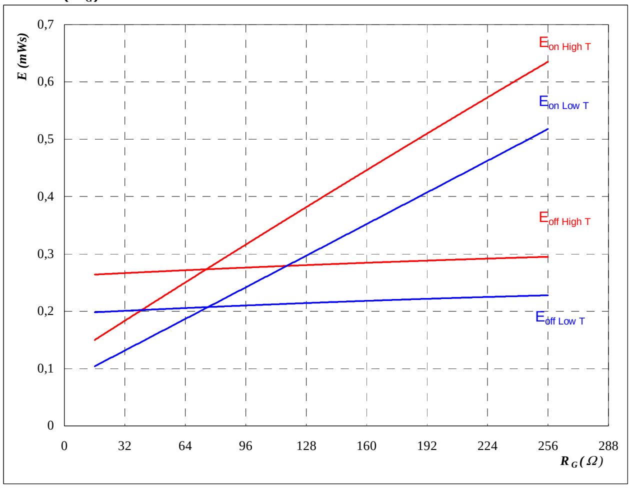
With an inductive load at

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	64	Ω
R_{goff} =	64	Ω

Figure 6 Inverter IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



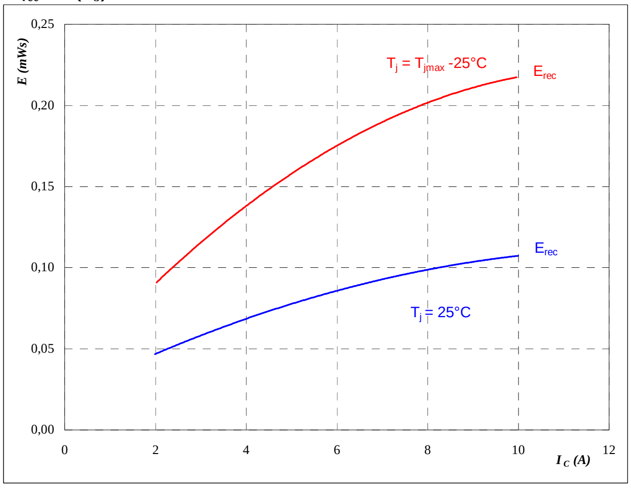
With an inductive load at

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	6	A

Figure 7 Inverter Diode

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



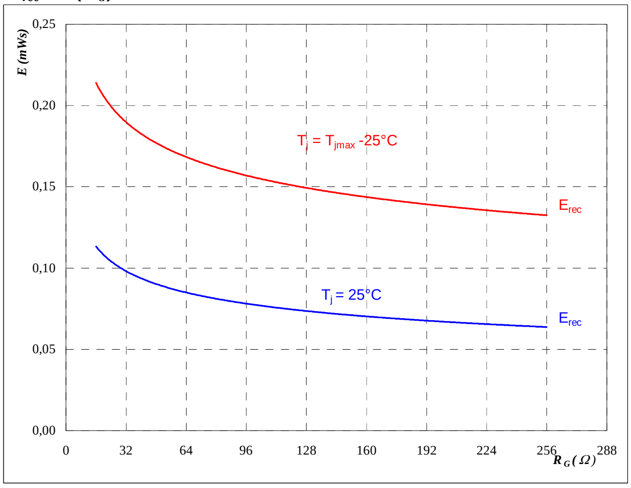
With an inductive load at

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	64	Ω

Figure 8 Inverter Diode

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

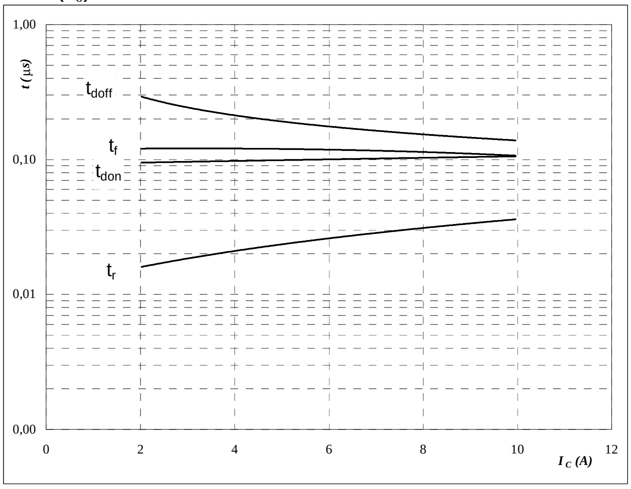
T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	6	A

Inverter Characteristics

Figure 9 Inverter IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



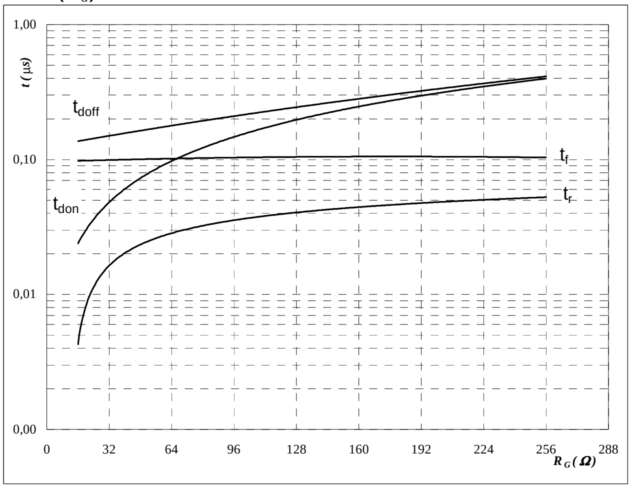
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	64	Ω
R_{goff} =	64	Ω

Figure 10 Inverter IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



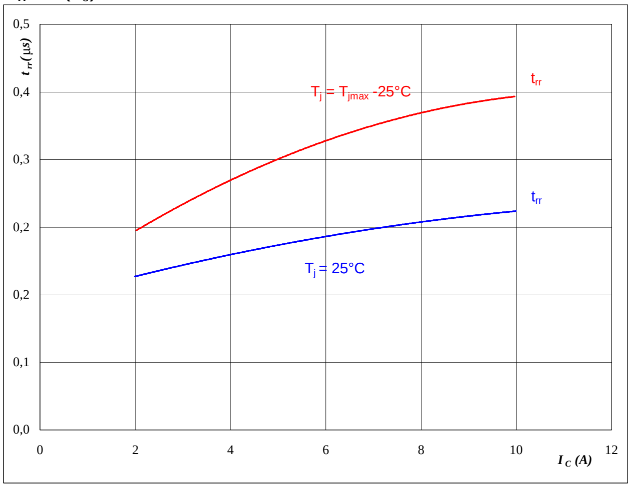
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	6	A

Figure 11 Inverter Diode

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



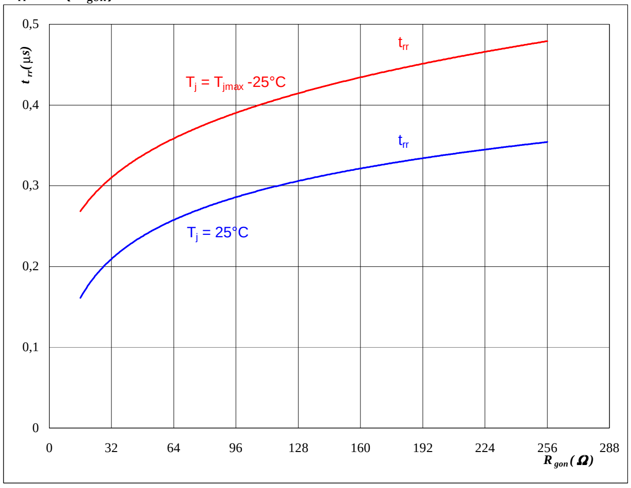
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	64	Ω

Figure 12 Inverter Diode

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

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



At

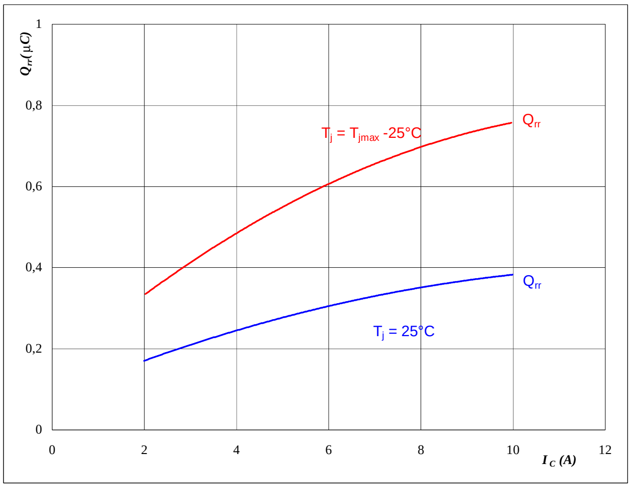
T_j =	25/125	°C
V_R =	400	V
I_F =	6	A
V_{GE} =	±15	V

Inverter Characteristics

Figure 13 Inverter Diode

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



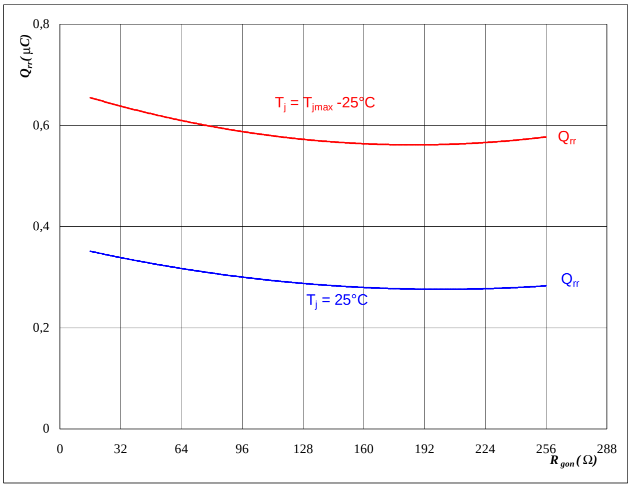
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	64	Ω

Figure 14 Inverter Diode

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

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



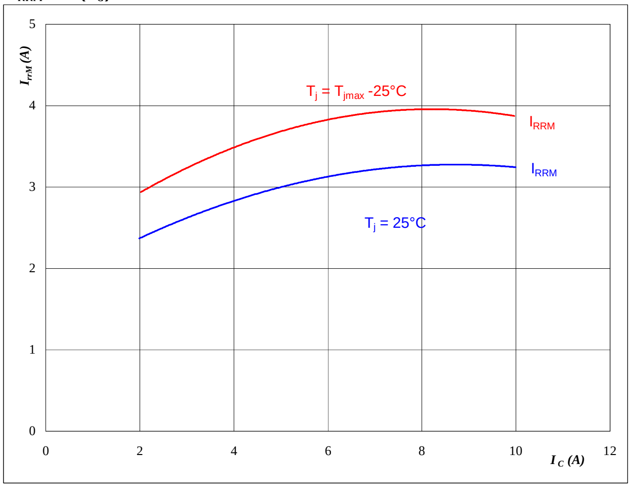
At

T_j =	25/125	°C
V_R =	400	V
I_F =	6	A
V_{GE} =	±15	V

Figure 15 Inverter Diode

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



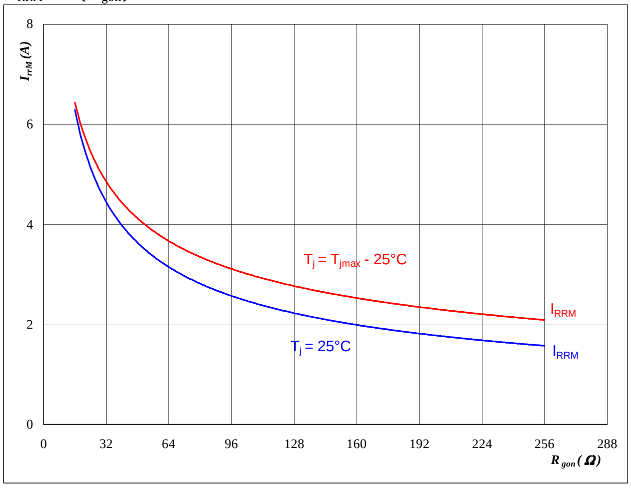
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	64	Ω

Figure 16 Inverter Diode

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

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



At

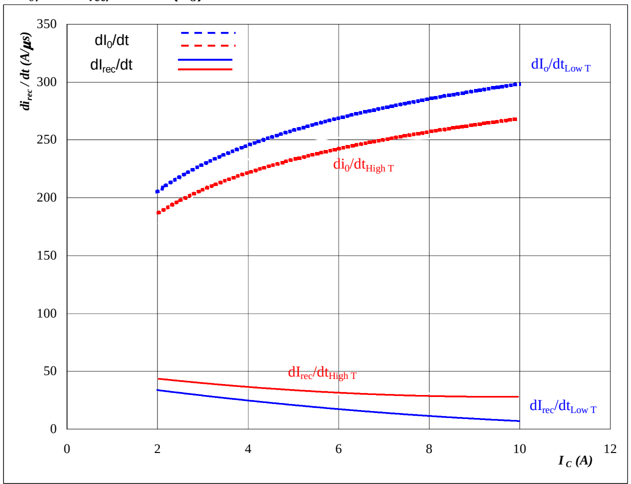
T_j =	25/125	°C
V_R =	400	V
I_F =	6	A
V_{GE} =	±15	V

Inverter Characteristics

Figure 17 Inverter Diode

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

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



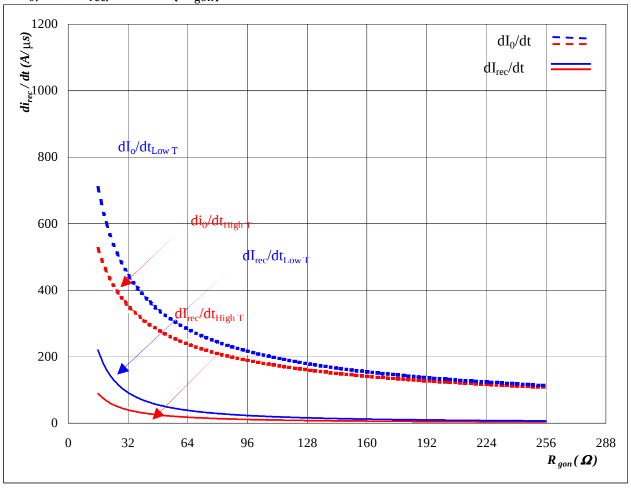
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	64	Ω

Figure 18 Inverter Diode

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

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



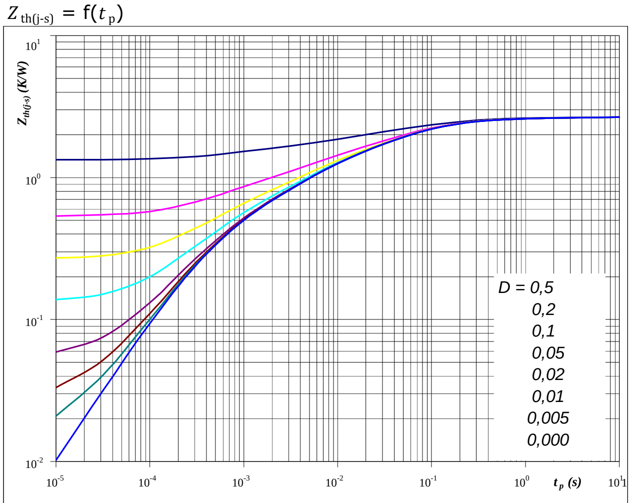
At

T_j =	25/125	°C
V_R =	400	V
I_F =	6	A
V_{GE} =	±15	V

Figure 19 Inverter IGBT

IGBT transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	2,66	K/W

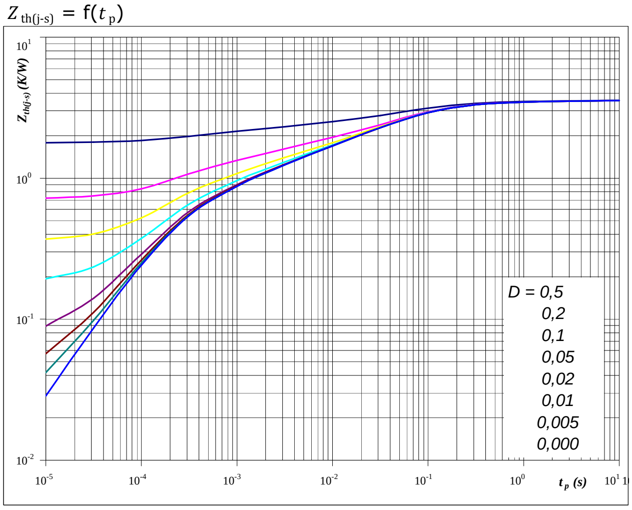
IGBT thermal model values

R (K/W)	Tau (s)
1,12E-01	1,79E+00
4,34E-01	1,79E-01
8,19E-01	4,95E-02
6,08E-01	9,45E-03
3,80E-01	2,26E-03
3,08E-01	3,96E-04

Figure 20 Inverter Diode

FWD transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	3,55	K/W

FWD thermal model values

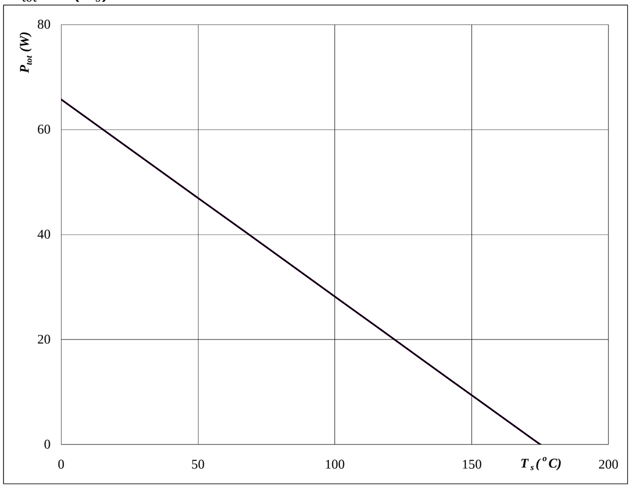
R (K/W)	Tau (s)
1,62E-01	1,97E+00
7,21E-01	1,62E-01
1,17E+00	3,94E-02
5,18E-01	6,69E-03
4,51E-01	1,33E-03
5,35E-01	2,17E-04

Inverter Characteristics

Figure 21 Inverter IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



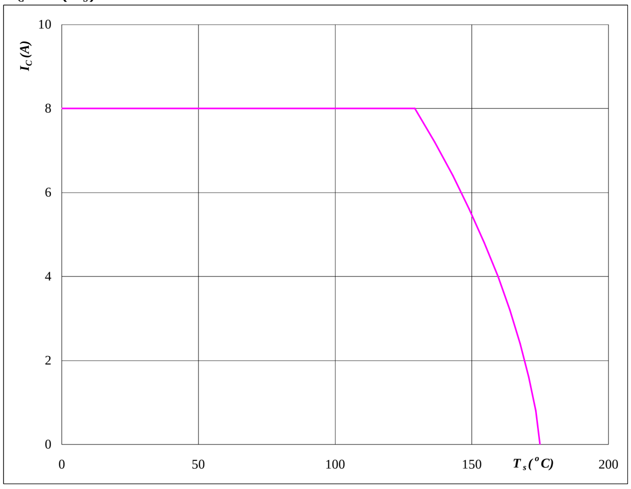
At

T_j = 175 °C

Figure 22 Inverter IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

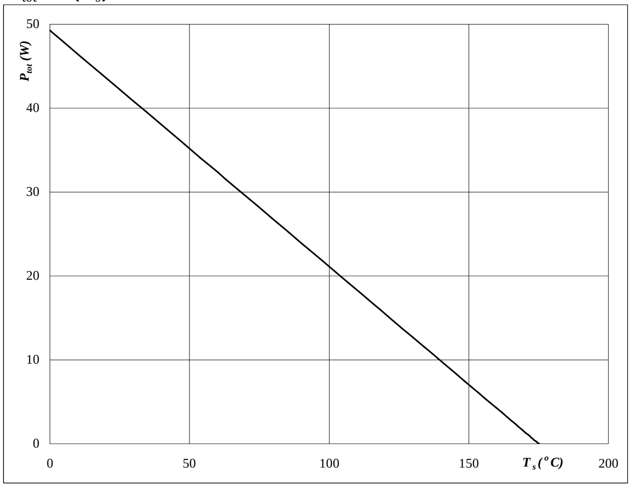
T_j = 175 °C

V_{GE} = 15 V

Figure 23 Inverter Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



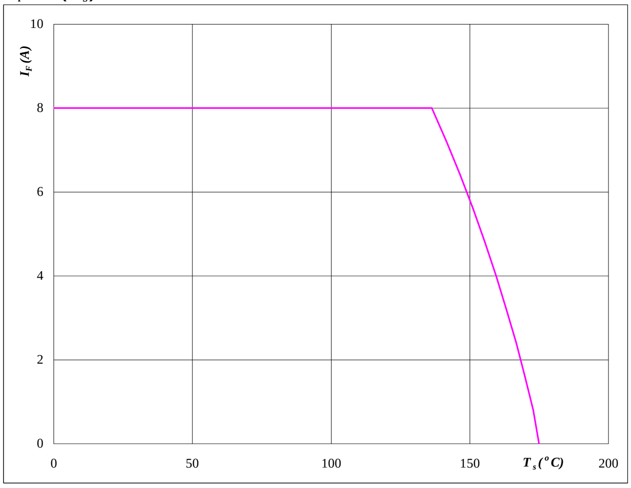
At

T_j = 175 °C

Figure 24 Inverter Diode

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

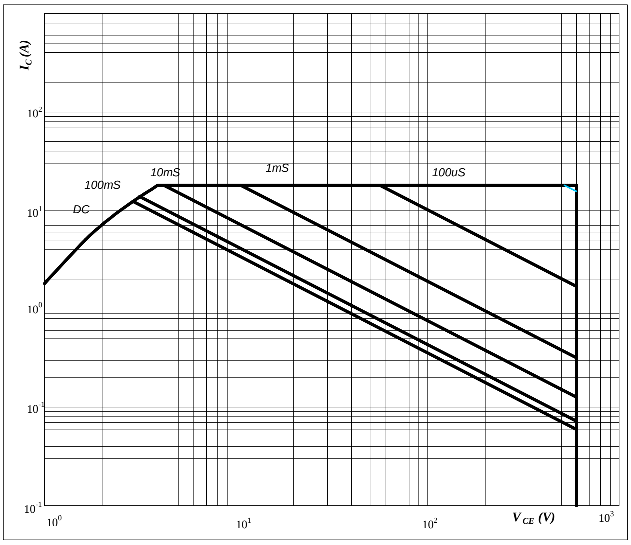
T_j = 175 °C

Inverter Characteristics

Figure 25 Inverter IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



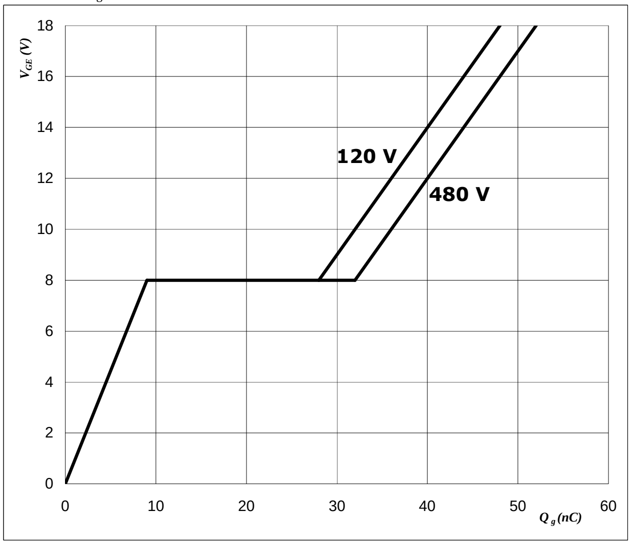
At

D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Figure 26 Inverter IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



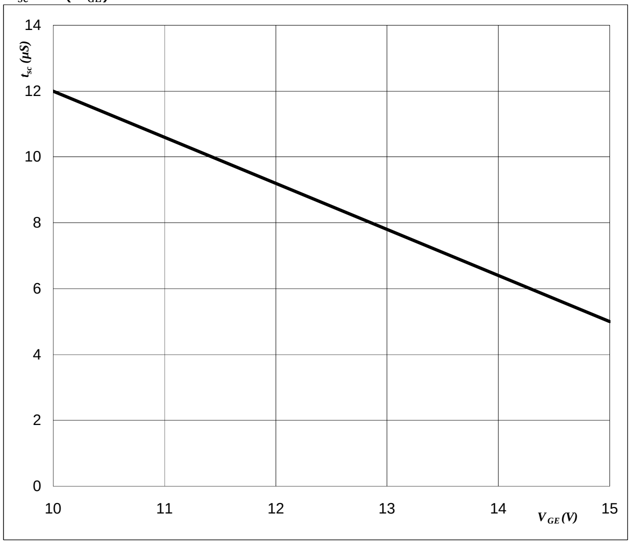
At

I_C =	6	A

Figure 27 Inverter IGBT

Short circuit withstand time as a function of gate-emitter voltage

$t_{sc} = f(V_{GE})$



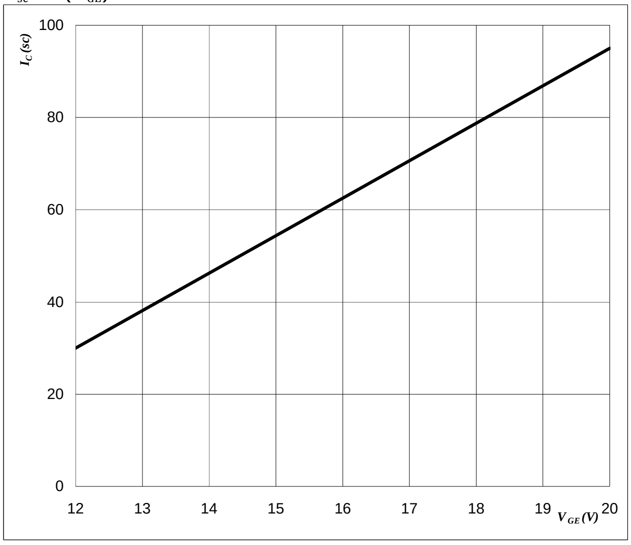
At

V_{CE} =	600	V
T_j ≤	175	ºC

Figure 28 Inverter IGBT

Typical short circuit collector current as a function of gate-emitter voltage

$I_{sc} = f(V_{GE})$



At

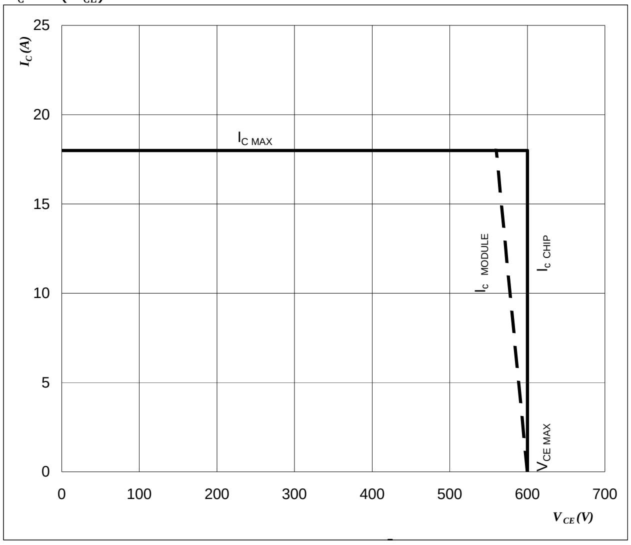
V_{CE} ≤	600	V
T_j =	175	ºC

Inverter Characteristics

Figure 29 IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

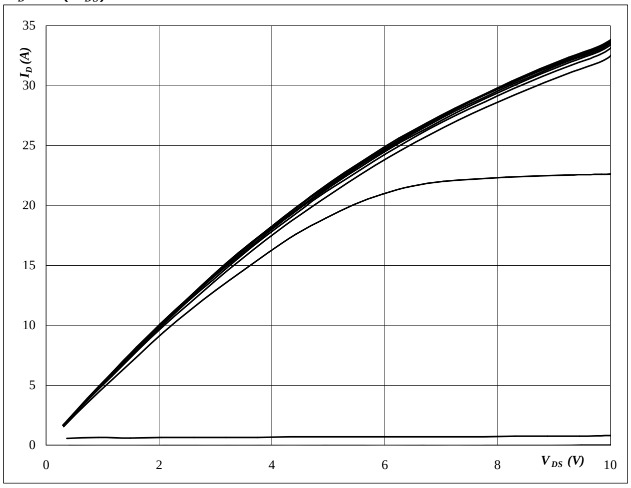
T_j = T_{jmax}-25 ºC

PFC Characteristics

Figure 1 PFC MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 μs

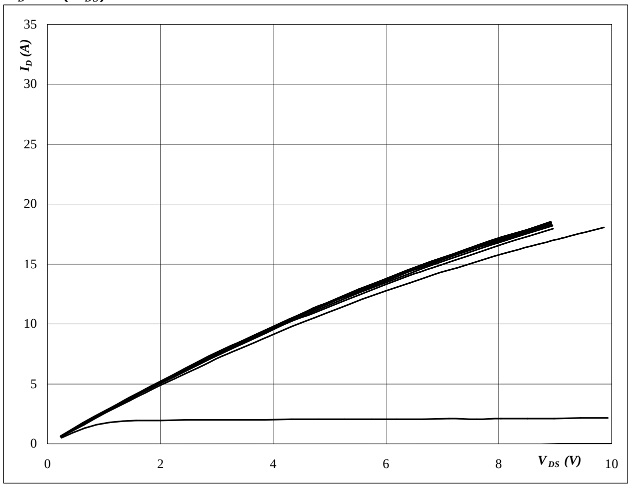
T_j = 25 °C

V_{GS} from 0 V to 20 V in steps of 2 V

Figure 2 PFC MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 μs

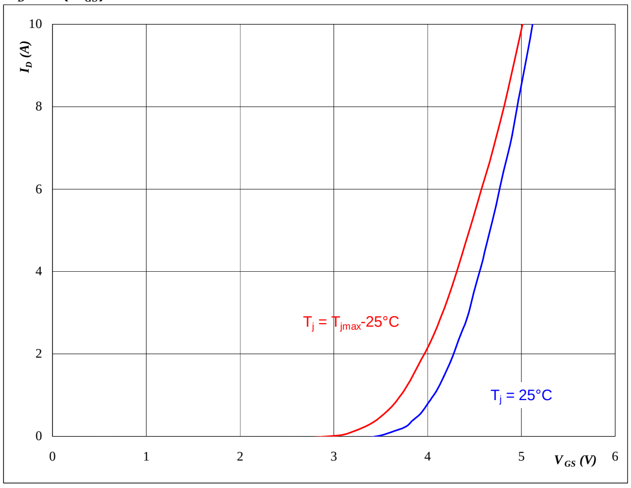
T_j = 125 °C

V_{GS} from 0 V to 20 V in steps of 2 V

Figure 3 PFC MOSFET

Typical transfer characteristics

$I_D = f(V_{GS})$



At

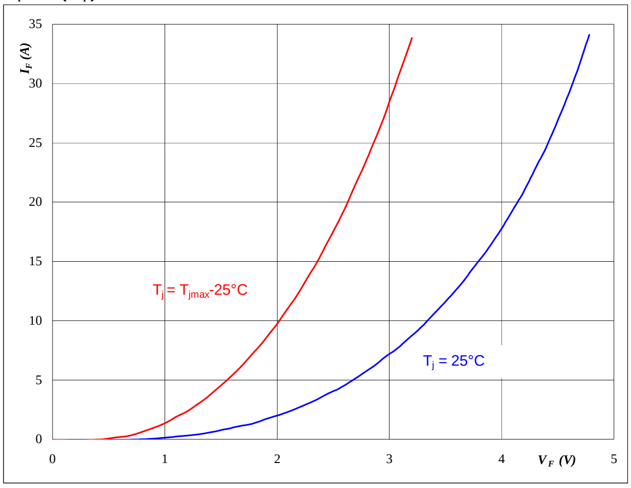
t_p = 250 μs

V_{DS} = 10 V

Figure 4 PFC Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

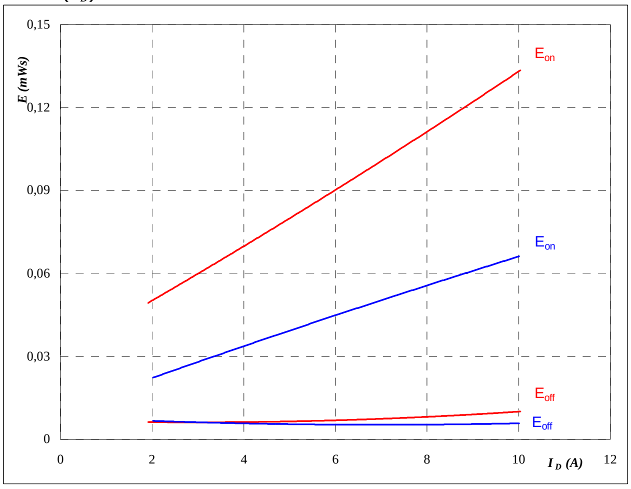
t_p = 250 μs

PFC Characteristics

Figure 5	PFC MOSFET

Typical switching energy losses as a function of drain current

$E = f(I_D)$



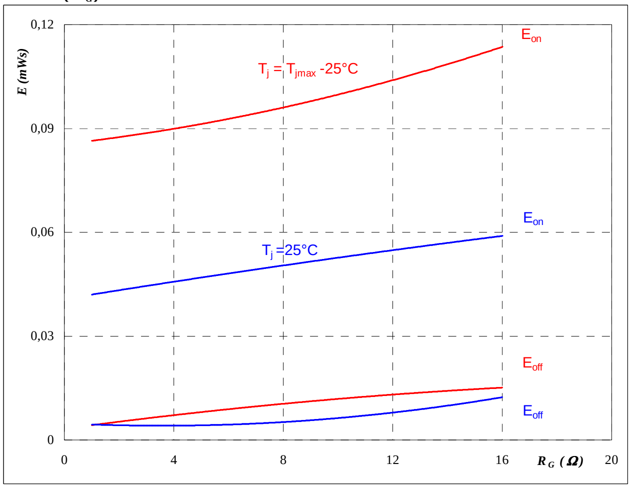
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 6	PFC MOSFET

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



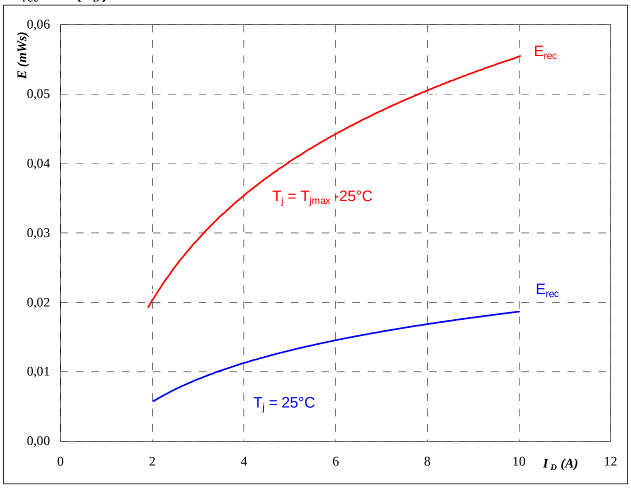
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
I_D =	6	A

Figure 7	PFC MOSFET

Typical reverse recovery energy loss as a function of drain current

$E_{rec} = f(I_D)$



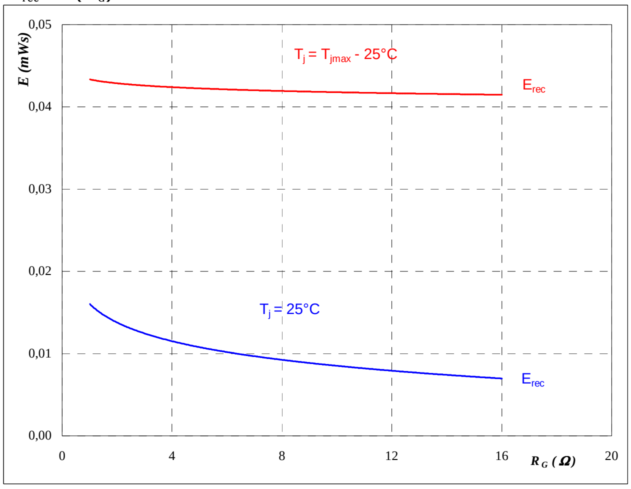
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 8	PFC MOSFET

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

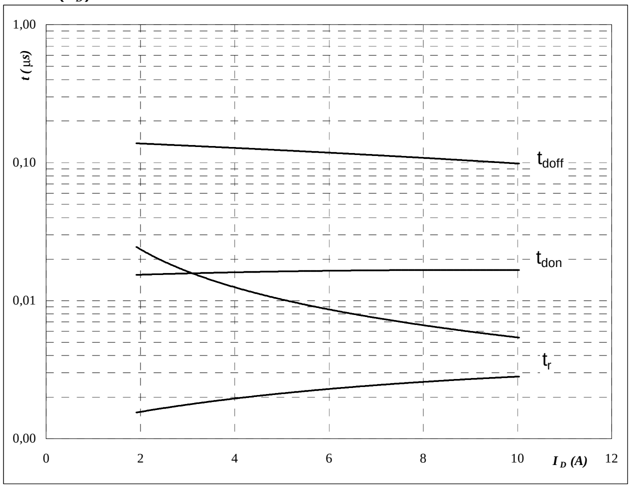
T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
I_D =	6	A

PFC Characteristics

Figure 9	PFC MOSFET

Typical switching times as a as a function of drain current

$t = f(I_D)$



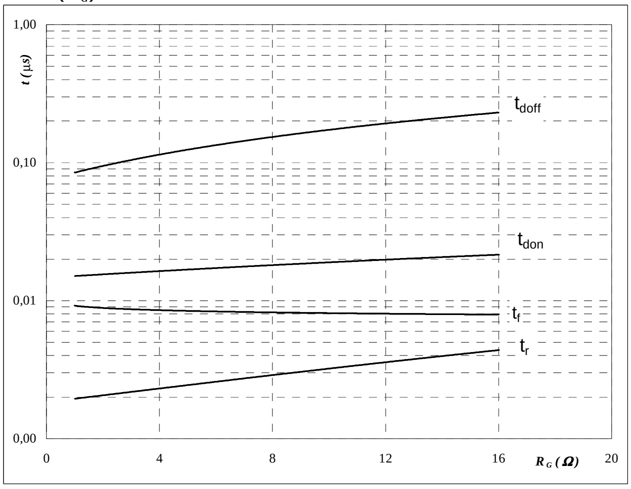
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 10	PFC MOSFET

Typical switching times as a function of gate resistor

$t = f(R_G)$



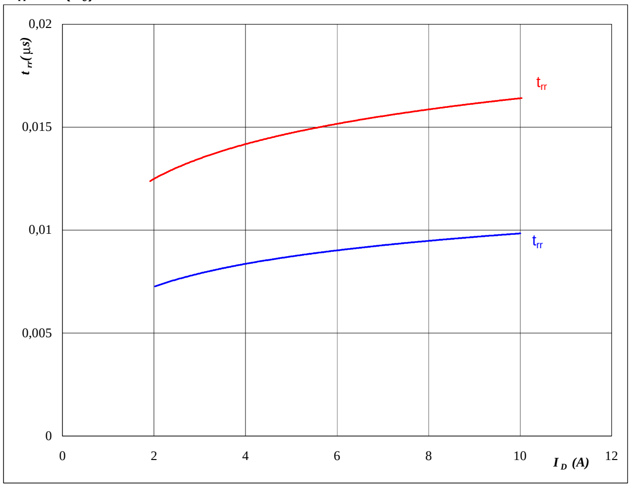
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	10	V
I_D =	6	A

Figure 11	PFC Diode

Typical reverse recovery time as a as a function of drain current

$t_{rr} = f(I_c)$



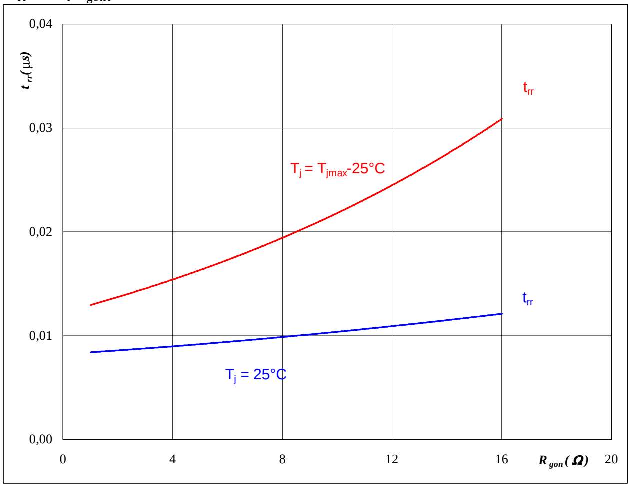
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	4	Ω

Figure 12	PFC Diode

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

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



At

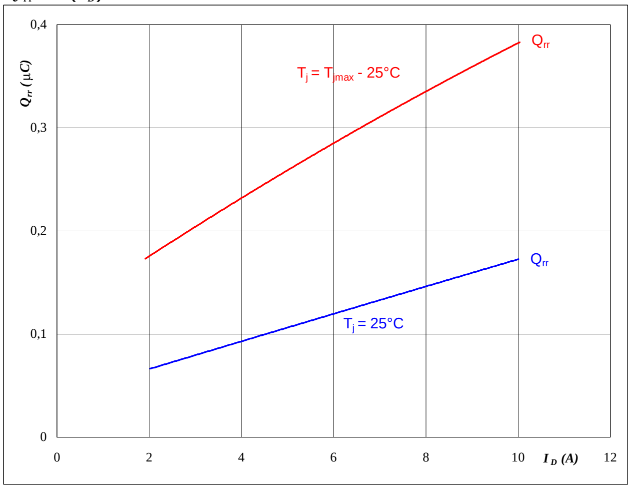
T_j =	25/125	°C
V_R =	400	V
I_F =	6	A
V_{GS} =	10	V

PFC Characteristics

Figure 13 PFC Diode

Typical reverse recovery charge as a as a function of drain current

$Q_{rr} = f(I_D)$



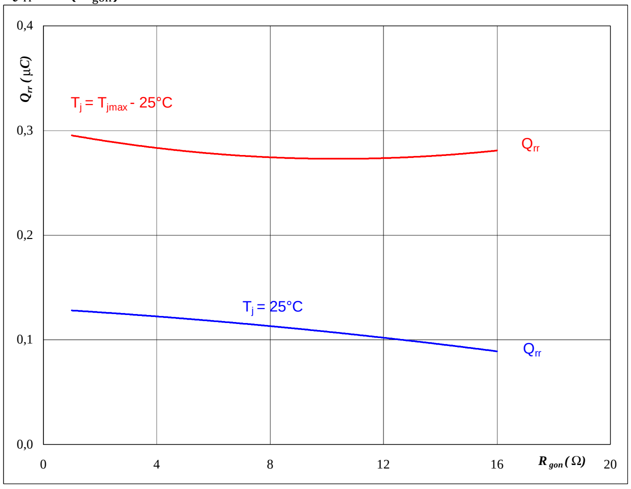
At

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	4	Ω

Figure 14 PFC Diode

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

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



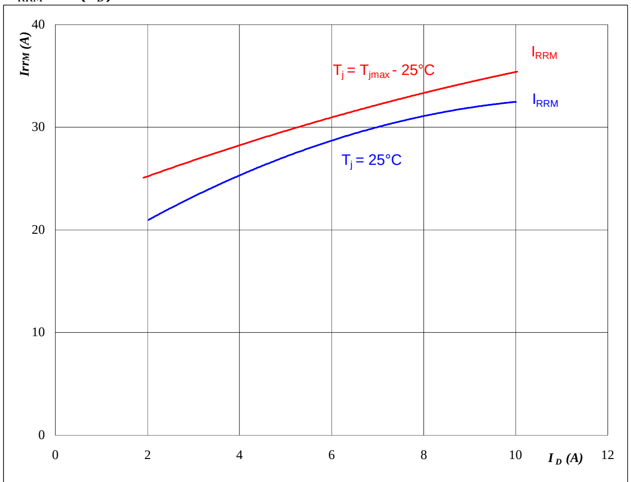
At

T_j =	25/125	°C
V_R =	400	V
I_F =	6	A
V_{GS} =	10	V

Figure 15 PFC Diode

Typical reverse recovery current as a as a function of drain current

$I_{RRM} = f(I_D)$



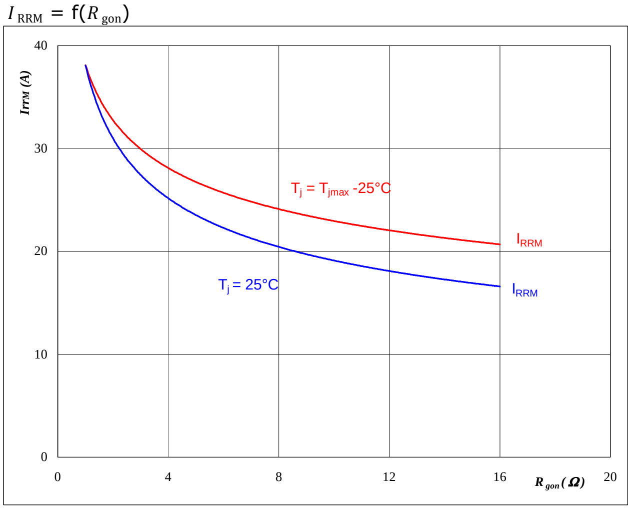
At

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	4	Ω

Figure 16 PFC Diode

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

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



At

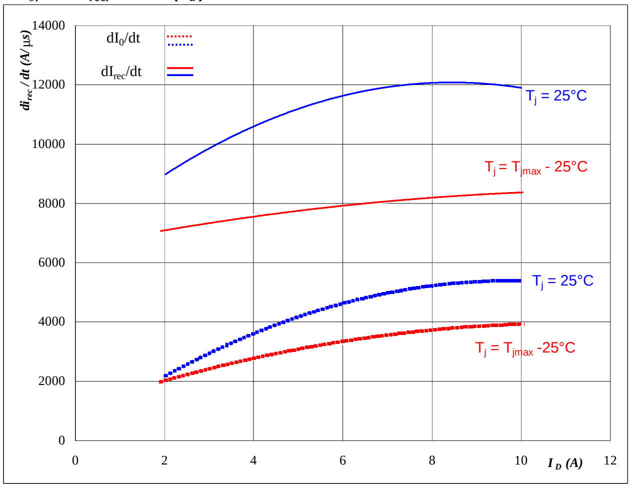
T_j =	25/125	°C
V_R =	400	V
I_F =	6	A
V_{GS} =	10	V

PFC Characteristics

Figure 17 PFC Diode

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

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



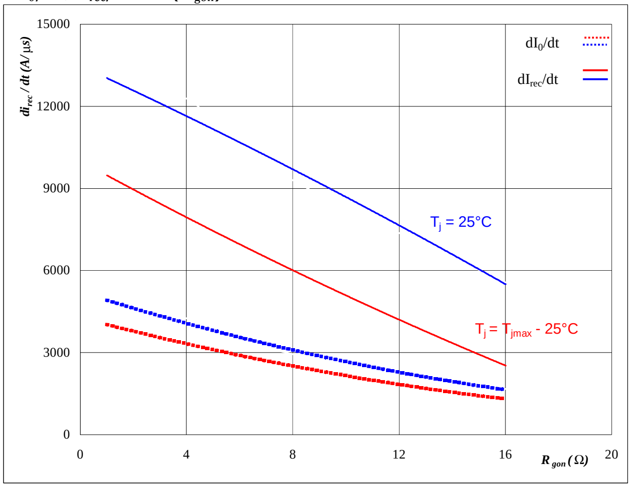
At

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	4	Ω

Figure 18 PFC Diode

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

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



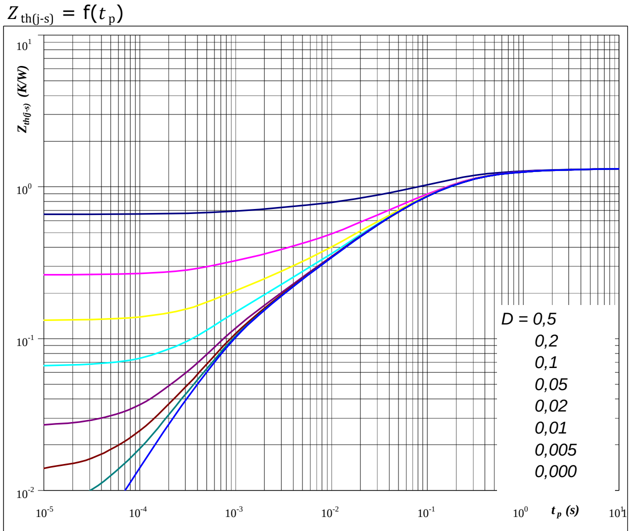
At

T_j =	25/125	°C
V_R =	400	V
I_F =	6	A
V_{GS} =	10	V

Figure 19 PFC MOSFET

MOSFET transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	1,32	K/W

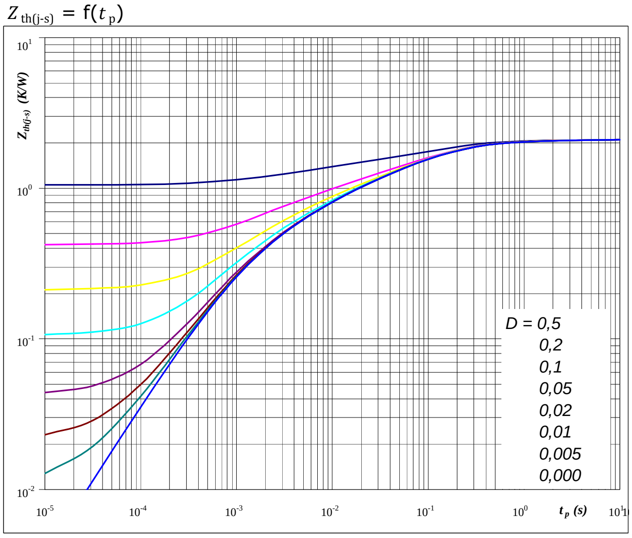
IGBT thermal model values

R (K/W)	Tau (s)
6,07E-02	2,94E+00
1,82E-01	4,56E-01
5,66E-01	1,17E-01
2,74E-01	2,61E-02
1,33E-01	6,31E-03
9,91E-02	8,98E-04

Figure 20 PFC Diode

FWD transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	2,10	K/W

FWD thermal model values

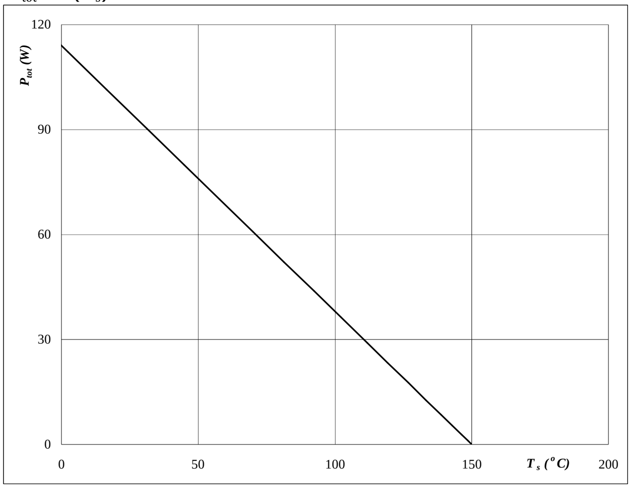
R (K/W)	Tau (s)
7,54E-02	2,95E+00
3,60E-01	3,15E-01
7,40E-01	7,85E-02
4,10E-01	1,41E-02
3,24E-01	3,24E-03
1,92E-01	8,47E-04

PFC Characteristics

Figure 21 PFC MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



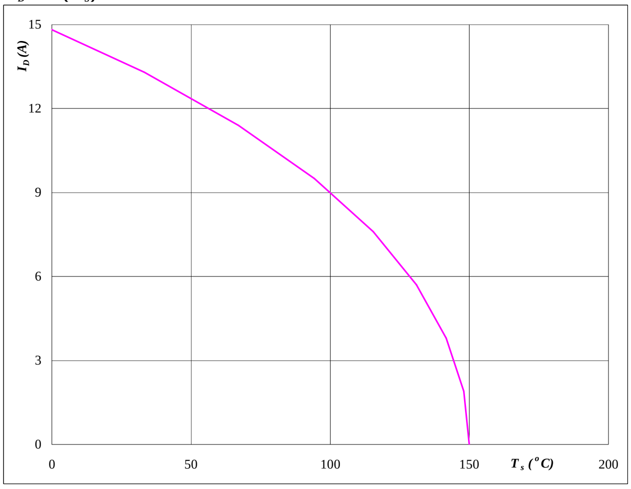
At

T_j = 150 ºC

Figure 22 PFC MOSFET

Drain current as a function of heatsink temperature

$I_D = f(T_s)$



At

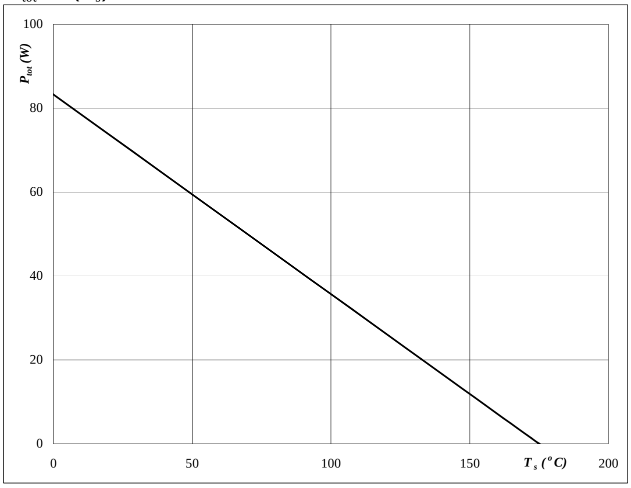
T_j = 150 ºC

V_{GS} = 10 V

Figure 23 PFC Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



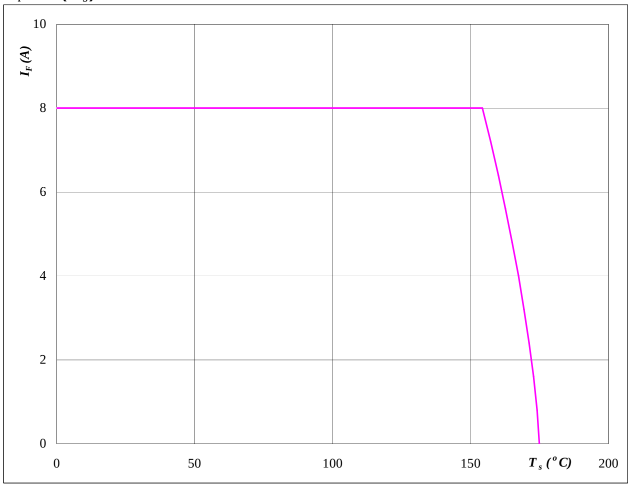
At

T_j = 175 ºC

Figure 24 PFC Diode

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

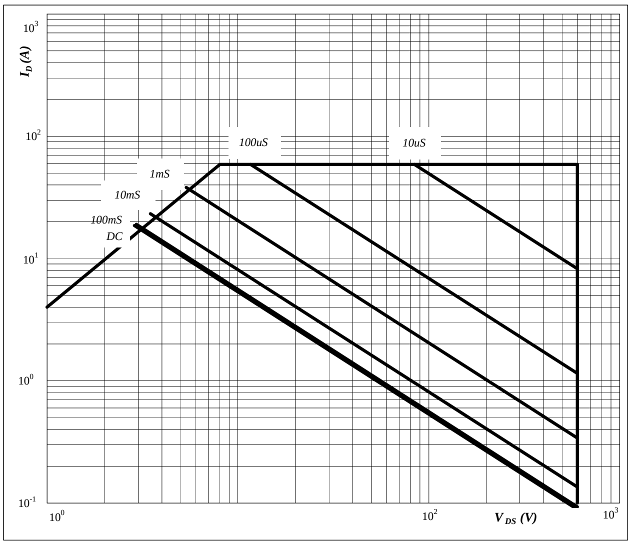
T_j = 175 ºC

PFC Characteristics

Figure 25 PFC MOSFET

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



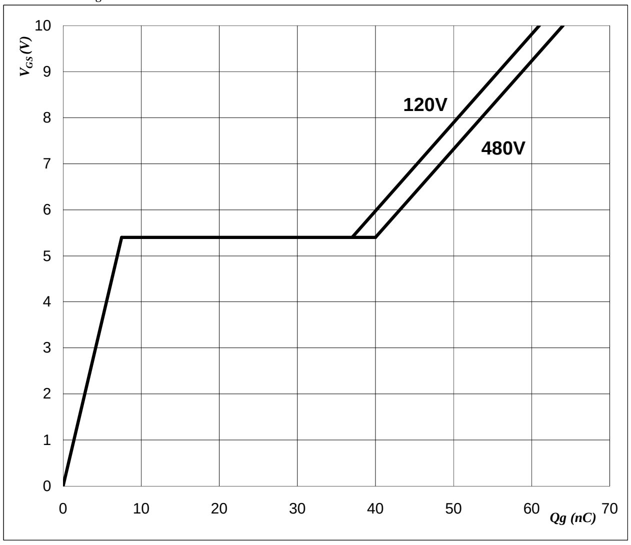
At

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

Figure 26 PFC MOSFET

Gate voltage vs Gate charge

$V_{GS} = f(Q_g)$



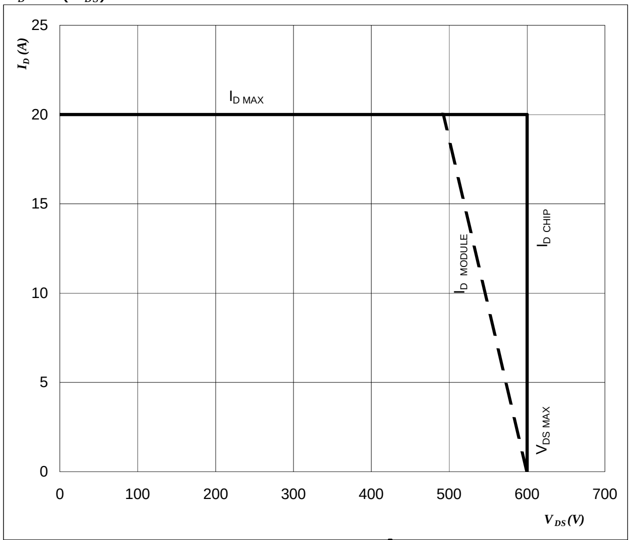
At

I_D =	6	A

Figure 29 IGBT

Reverse bias safe operating area

$I_D = f(V_{DS})$



At

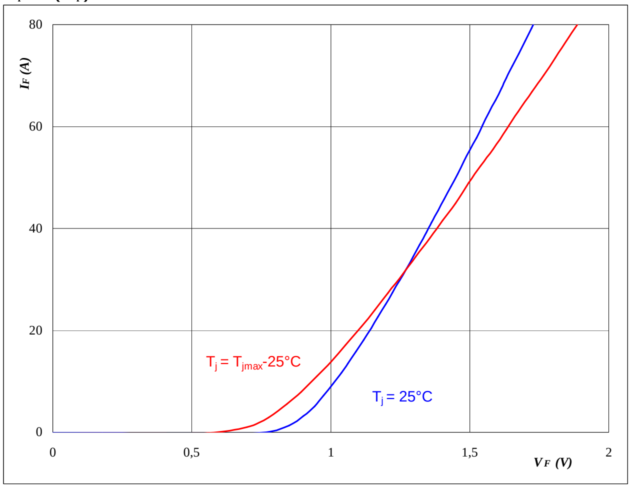
T_j =	T_{jmax}-25	ºC

Rectifier Characteristics

Figure 1 Rectifier Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



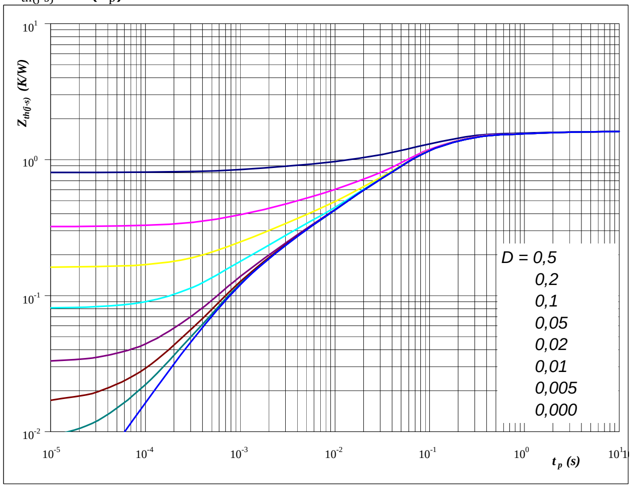
At

t_p = 250 µs

Figure 2 Rectifier Diode

Diode transient thermal impedance as a function of pulse width

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



At

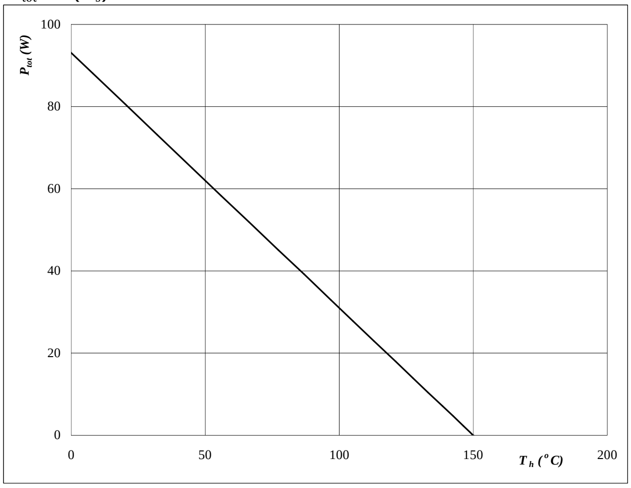
$D = t_p / T$

$R_{th(j\text{-}s)}$ = 1,61 K/W

Figure 3 Rectifier Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



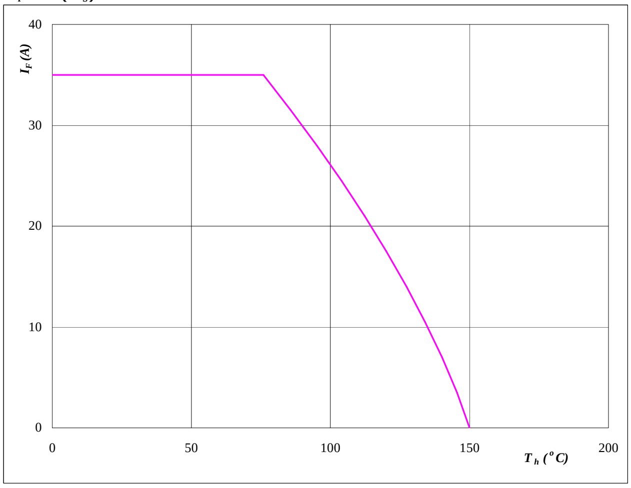
At

T_j = 150 ºC

Figure 4 Rectifier Diode

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



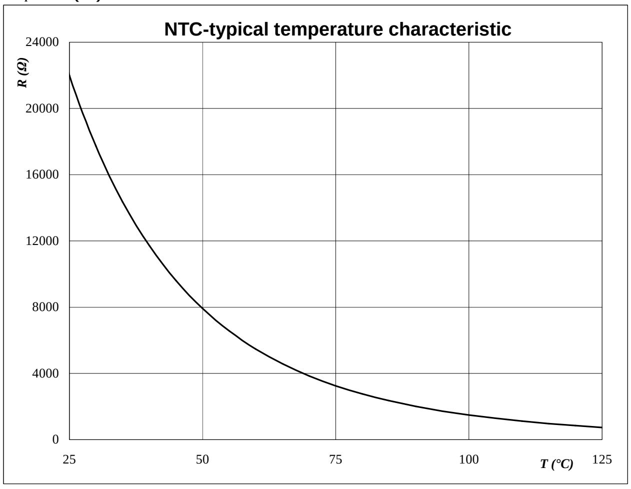
At

T_j = 150 ºC

Thermistor Characteristics

Figure 1 Thermistor

Typical NTC characteristic
as a function of temperature
$R_T = f(T)$



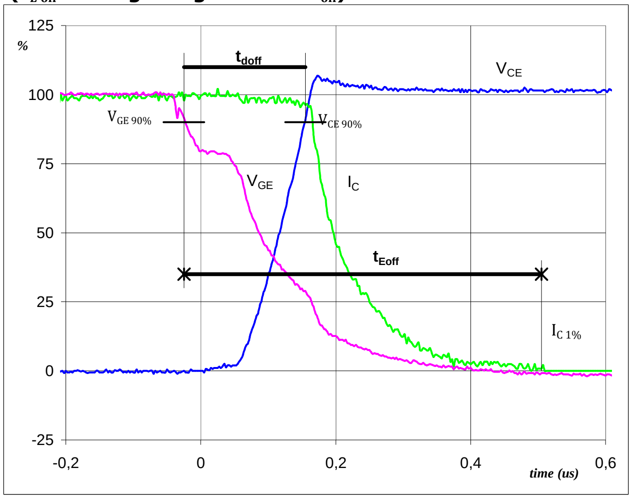
Switching Definitions Inverter

General conditions

T_j	=	125 °C
R_{gon}	=	64 Ω
R_{goff}	=	64 Ω

Figure 1 Inverter IGBT

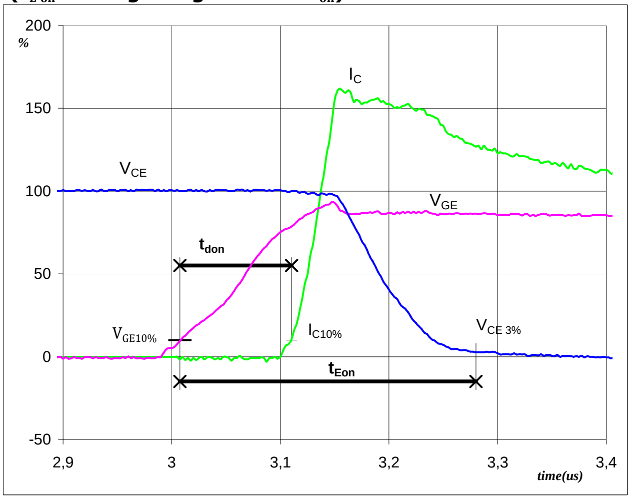
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} ($t_{E off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	400	V
I_C (100%) =	6	A
t_{doff} =	0,18	μs
$t_{E off}$ =	0,53	μs

Figure 2 Inverter IGBT

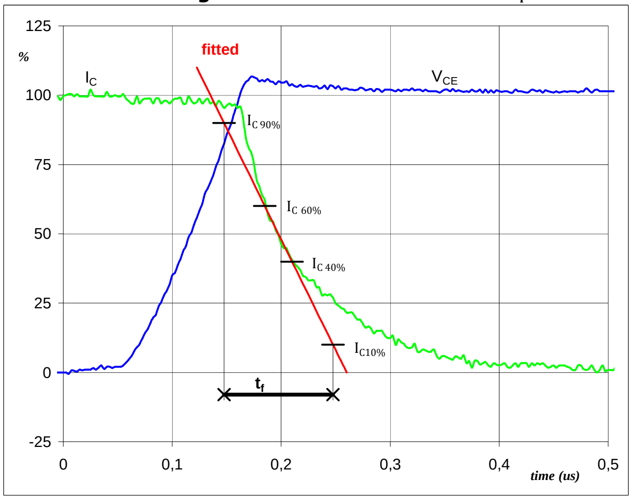
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} ($t_{E on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	400	V
I_C (100%) =	6	A
t_{don} =	0,10	μs
$t_{E on}$ =	0,27	μs

Figure 3 Inverter IGBT

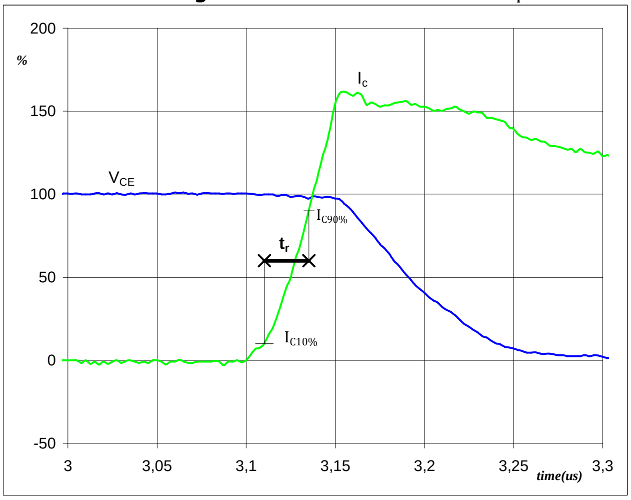
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	400	V
I_C (100%) =	6	A
t_f =	0,11	μs

Figure 4 Inverter IGBT

Turn-on Switching Waveforms & definition of t_r

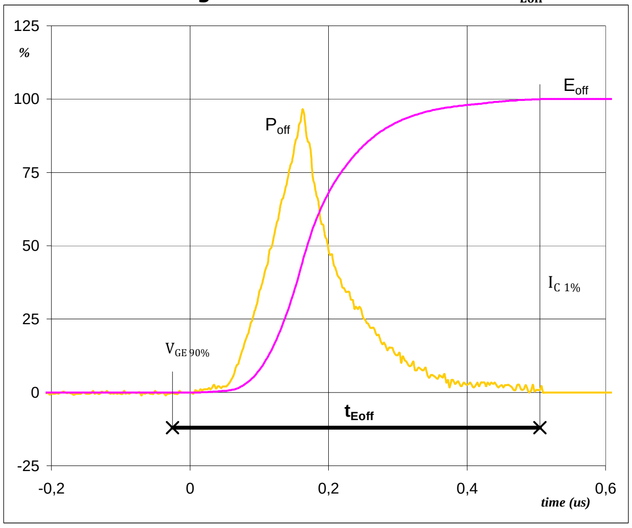


V_C (100%) =	400	V
I_C (100%) =	6	A
t_r =	0,03	μs

Switching Definitions Inverter

Figure 5 Inverter IGBT

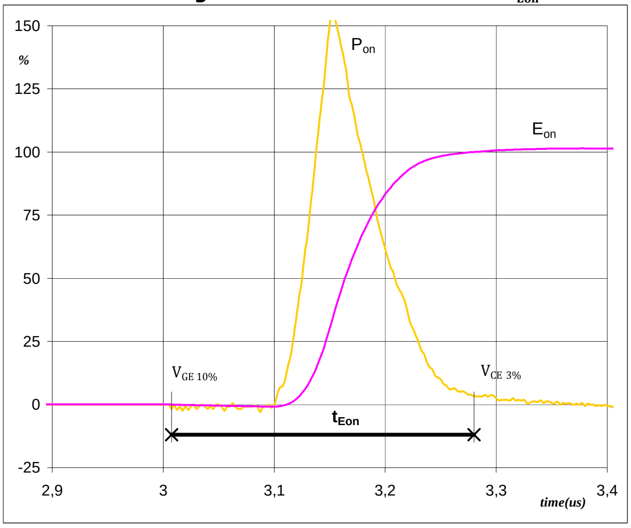
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	2,41	kW
E_{off} (100%) =	0,27	mJ
$t_{E\,off}$ =	0,53	µs

Figure 6 Inverter IGBT

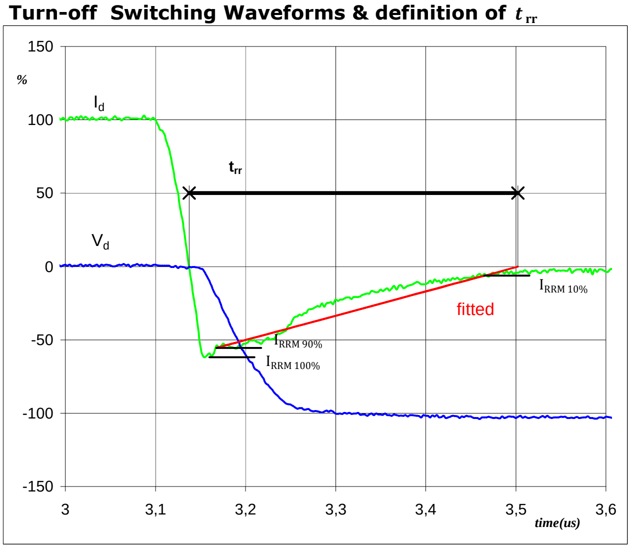
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	2,41	kW
E_{on} (100%) =	0,25	mJ
$t_{E\,on}$ =	0,27	µs

Figure 7 Inverter Diode

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

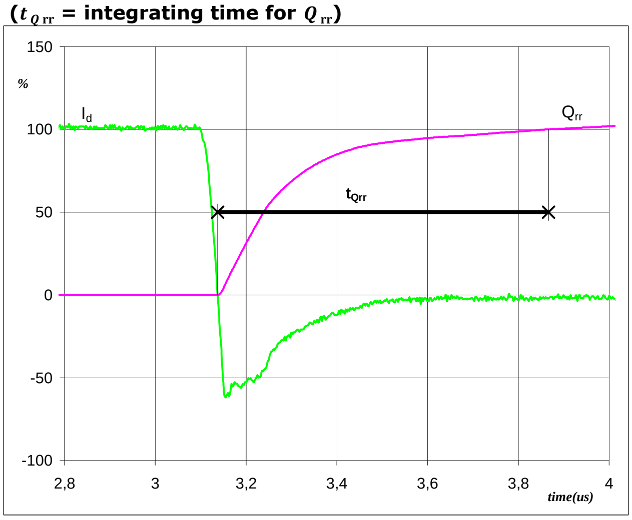


V_d (100%) =	400	V
I_d (100%) =	6	A
I_{RRM} (100%) =	-4	A
t_{rr} =	0,34	µs

Switching Definitions Inverter

Figure 8 Inverter Diode

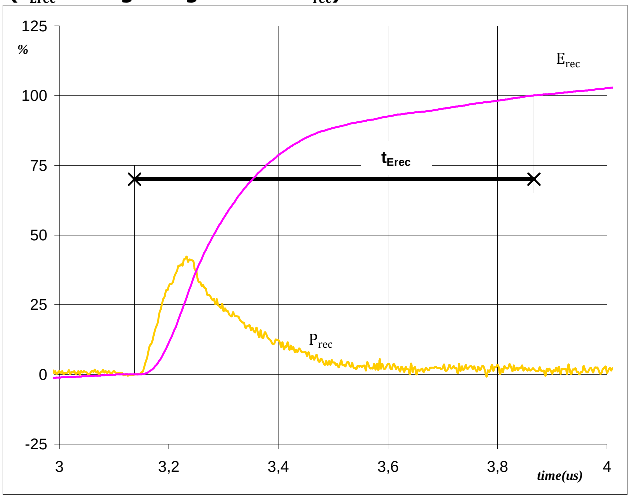
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	6	A
Q_{rr} (100%) =	0,60	µC
$t_{Q\,rr}$ =	0,73	µs

Figure 9 Inverter Diode

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



P_{rec} (100%) =	2,41	kW
E_{rec} (100%) =	0,17	mJ
$t_{E\,rec}$ =	0,73	µs

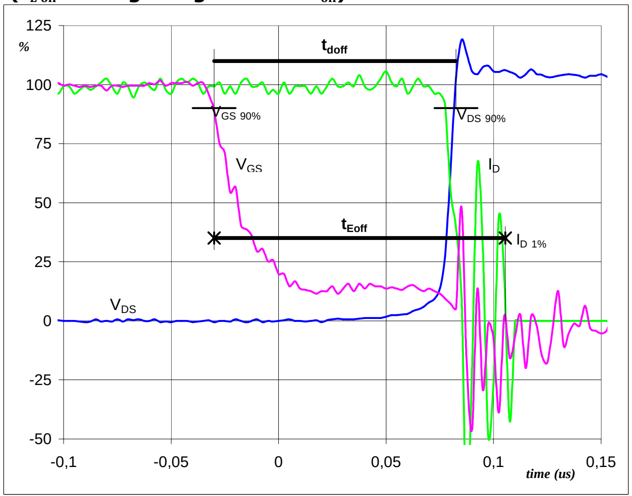
Switching Definitions PFC

General conditions

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

Figure 1 PFC MOSFET

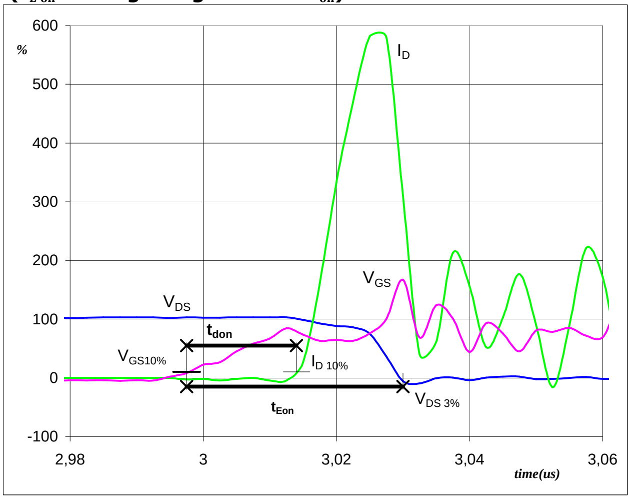
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GS} (0%) =	0	V
V_{GS} (100%) =	10	V
V_D (100%) =	400	V
I_D (100%) =	6	A
t_{doff} =	0,11	μs
$t_{E\,off}$ =	0,14	μs

Figure 2 PFC MOSFET

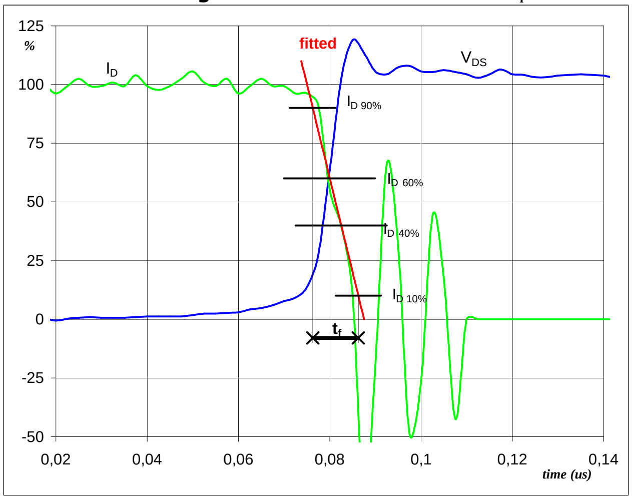
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GS} (0%) =	0	V
V_{GS} (100%) =	10	V
V_D (100%) =	400	V
I_D (100%) =	6	A
t_{don} =	0,02	μs
$t_{E\,on}$ =	0,03	μs

Figure 3 PFC MOSFET

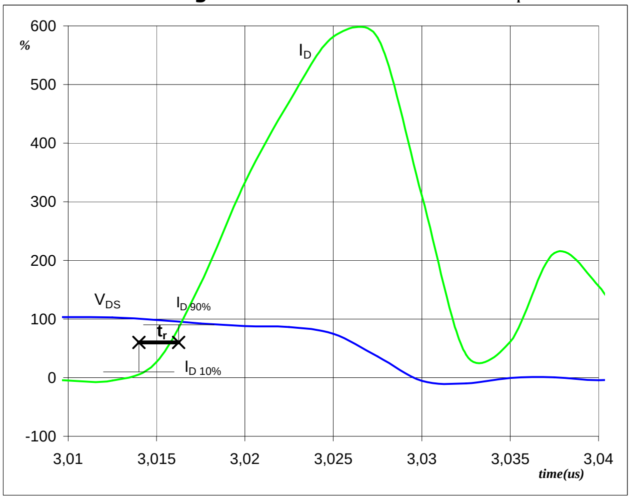
Turn-off Switching Waveforms & definition of t_f



V_D (100%) =	400	V
I_D (100%) =	6	A
t_f =	0,01	μs

Figure 4 PFC MOSFET

Turn-on Switching Waveforms & definition of t_r

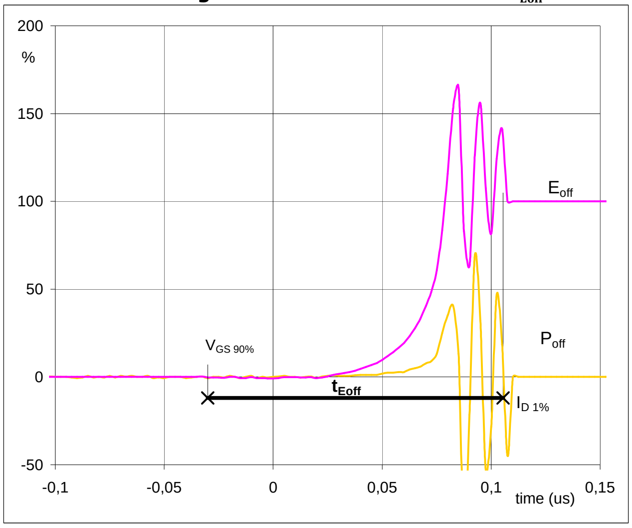


V_D (100%) =	400	V
I_C (100%) =	6	A
t_r =	0,002	μs

Switching Definitions PFC

Figure 5 PFC MOSFET

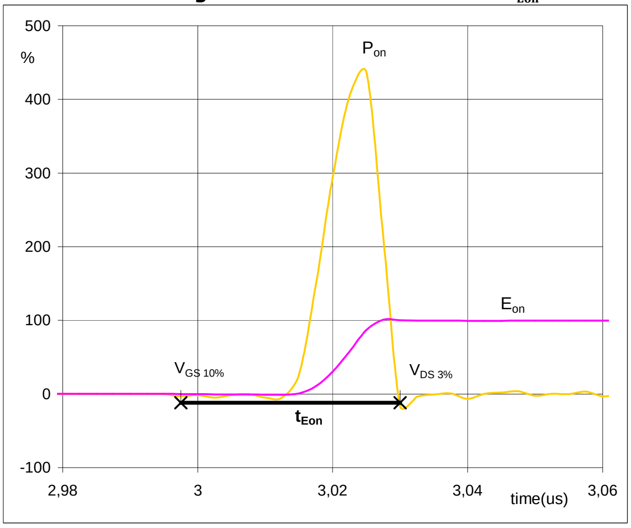
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	2,45	kW
E_{off} (100%) =	0,01	mJ
$t_{E\ off}$ =	0,14	μs

Figure 6 PFC MOSFET

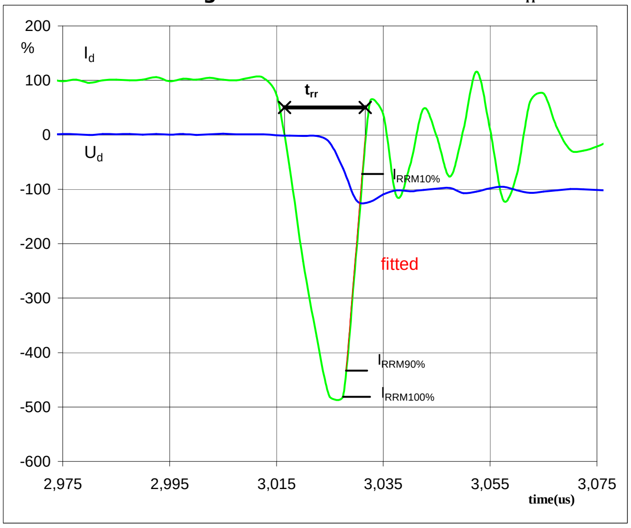
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	2,45	kW
E_{on} (100%) =	0,09	mJ
$t_{E\ on}$ =	0,0325	μs

Figure 7 PFC Diode

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

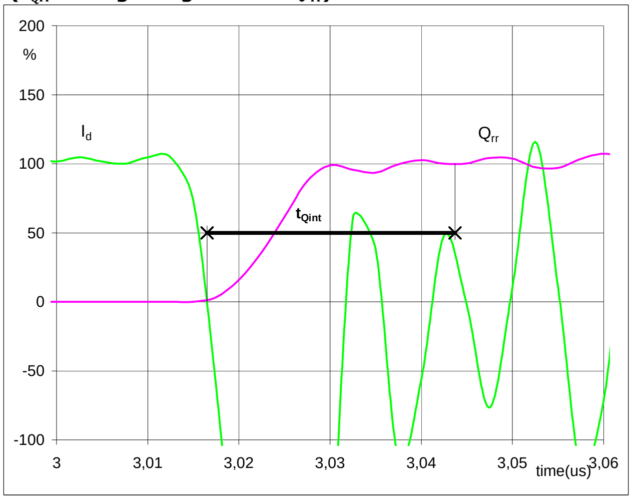


V_d (100%) =	400	V
I_d (100%) =	6	A
I_{RRM} (100%) =	-31	A
t_{rr} =	0,02	μs

Switching Definitions PFC

Figure 8	PFC Diode

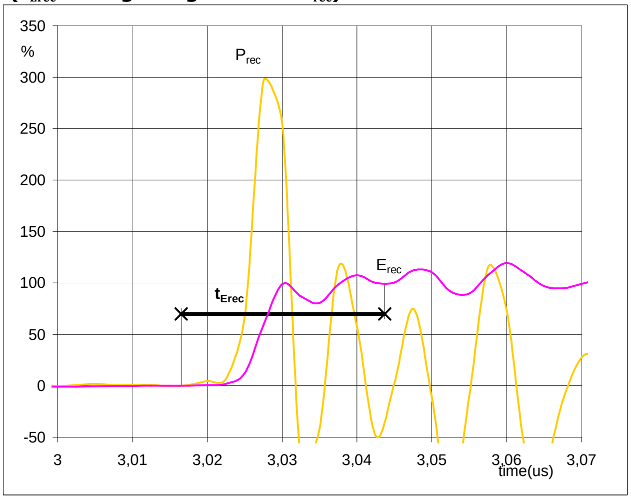
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



I_d (100%) =	6	A
Q_{rr} (100%) =	0,29	μC
t_{Qint} =	0,03	μs

Figure 9	PFC Diode

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



P_{rec} (100%) =	2,45	kW
E_{rec} (100%) =	0,04	mJ
$t_{E rec}$ =	0,03	μs

Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

Version	Ordering Code
without thermal paste 17mm housing with solder pins	10-F006PPA006SB-M682B
with thermal paste 17mm housing with solder pins	10-F006PPA006SB-M682B-/3/
without thermal paste 12mm housing with Press-fit pins	10-PC06PPA006SB-M682B06Y

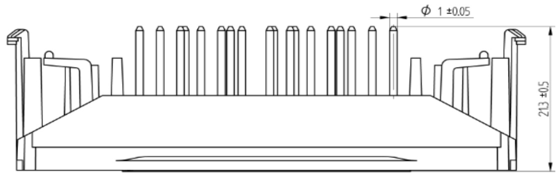
Text	VIN	Date code	Name&Ver	UL	Lot	Serial
	VIN	WWYY	NNNNNNVV	UL	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

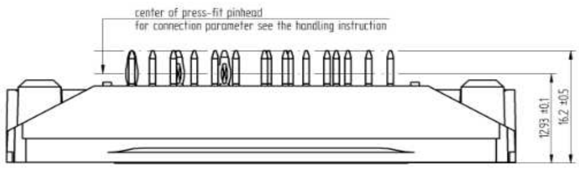
Pin table

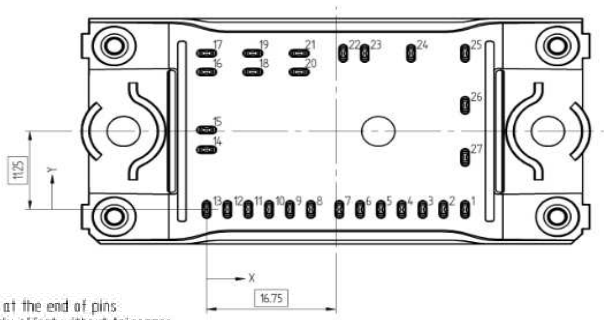
Pin	X	Y	Function
1	33,5	0	DC-
2	30,7	0	PFC-
3	28	0	S1
4	25,3	0	S2
5	22,6	0	INV-
6	19,9	0	G7
7	17,2	0	S7
8	13,5	0	G6
9	10,8	0	E6
10	8,1	0	G5
11	5,4	0	E5
12	2,7	0	G4
13	0	0	E4
14	0	8,6	NTC1
15	0	11,45	NTC2
16	0	19,8	G1
17	0	22,5	U
18	6	19,8	G2
19	6	22,5	V
20	12	19,8	G3
21	12	22,5	W
22	17,7	22,5	INV+
23	20,5	22,5	PFC+
24	26,5	22,5	PFC IN
25	33,5	22,5	DC+
26	33,5	15	L1
27	33,5	7,5	L2

17mm housing



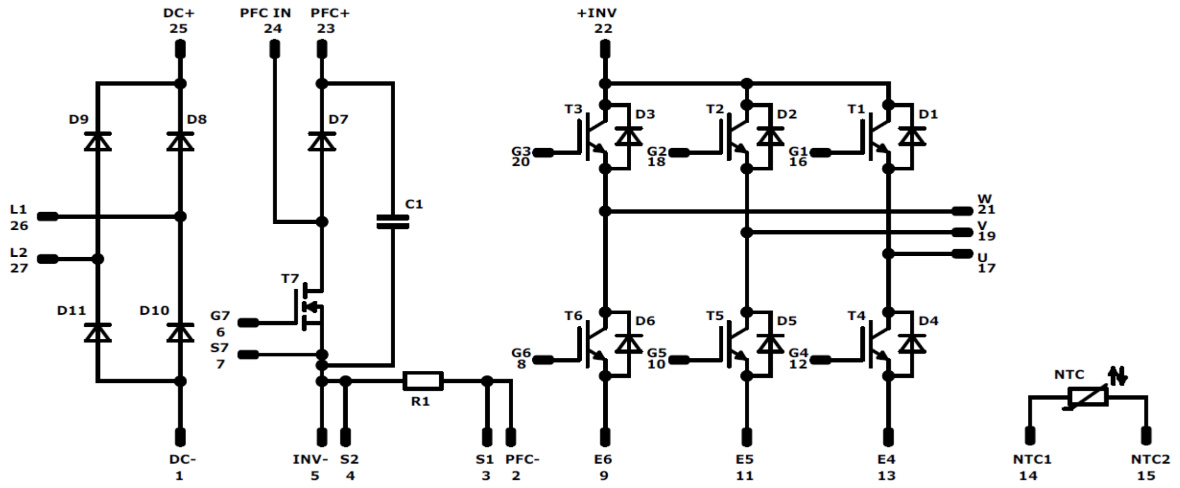
12mm housing





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

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	600 V	6 A	Inverter Switch	
D1,D2,D3,D4,D5,D6	FWD	600 V	6 A	Inverter Diode	
T7	MOSFET	600 V	190 mΩ	PFC Switch	
D7	FWD	600 V	6 A	PFC Diode	
D8,D9,D10,D11	Rectifier	1600 V	25 A	Rectifier Diode	
R1	Resistor			PFC Shunt	
C1	Capacitor	500 V		Capacitor (DC)	
NTC	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.

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-xx06PPA006SB-M682Bx-D2-14	30 May. 2016	New brand, PCM Rth values	all