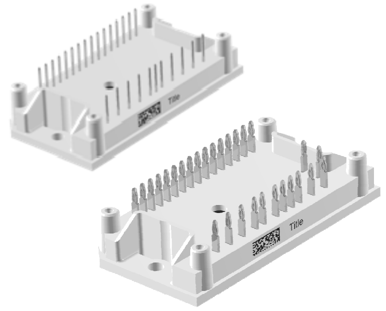
20-PB06IPB010RC01-P955A45Y
20-1B06IPB010RC01-P955A45
datasheet

flow IPM 1B | **600 V / 10 A**

Features
• CIP-topology (converter + inverter + PFC) • Optimized for PFC frequencies of 20kHz..100kHz and inverter frequencies of 4kHz..20kHz • Integrated PFC gate drive • PFC shunt • Inverter gate drive inclusive bootstrap for high side power supply • Over current and short circuit protection • Integrated DC-capacitor • Sense output of DC-current • Temperature sensor • Conclusive power flow, all power connections on one side, no input output X-ing • Optional pre-applied thermal interface material

flow IPM 1B

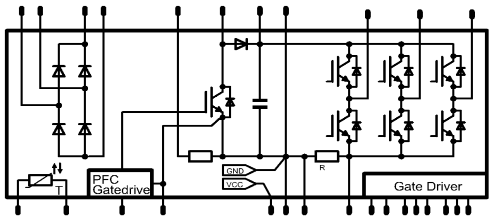


Solder pins

Press-fit

Target Applications
• Low Power Industrial Drives • Motor Integrated Fans and Pumps • AirCon • Electrical Tools

Schematic



Types
• 20-1B06IPB010RC01-P955A45 • 20-PB06IPB010RC01-P955A45Y

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_{FAV}	$T_j = T_{jmax}$ T_s = 80 °C T_c = 80 °C	13 14	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms	130	A
I^2t-value	I^2t		80	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C T_c = 80 °C	15 23	W
Maximum Junction Temperature	T_{jmax}		150	°C
PFC IGBT				
Collector-emitter breakdown voltage	V_{CE}		650	V
DC collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C T_c = 80 °C	12 14	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	90	A
Turn off safe operating area		V_{CE} ≤ 650V, $T_j \le T_{op}$ max	90	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C T_c = 80 °C	19 29	W
Gate-emitter peak voltage	V_{GE}		±20	V
Maximum Junction Temperature	T_{jmax}		175	°C

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Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
PFC Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	5 7	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	10 15	W
Maximum Junction Temperature	T_{jmax}			175	°C
PFC Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	10 14	A
Surge (non-repetitive) forward current	I_{FSM}	t_p=8,3 ms 60 Hz half sine wave		180	A
I^2t-value	I^2t			130	A^2s
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		60	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	17 26	W
Maximum Junction Temperature	T_{jmax}			175	°C
Inverter Transistor					
Collector-emitter breakdown voltage	V_{CE}			600	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	8 10	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		30	A
Turn off safe operating area		V_{CE} ≤ 600 V, T_j ≤ 150 °C		20	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	16 25	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		5 400	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 10	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C T_c = 80 °C	14 22	W
Maximum Junction Temperature	T_{jmax}			175	°C

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Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
PFC Shunt				
DC forward current	I_F		10	A
Power dissipation	P_{tot}		10	W
PFC Driver*				
Collector-emitter voltage	V_{CEO}		45	V
Collector current	I_C		500	mA
Peak collector current	I_{CM}	$t_P \leq$ 10 ms	1000	mA
Base current	I_B		100	mA
Peak base current	I_{BM}		200	mA
Maximum Junction Temperature	$T_j$max		150	°C

* for more information see infineon's datasheet BC817

Parameter	Symbol	Condition	Value	Unit
DC - Shunt				
DC forward current	I_F		8	A
Power dissipation	P_{tot}		5	W
DC link Capacitor				
Maximum DC voltage	U_{MAX}		500	V
Gate Driver				
Supply voltage	U_{CC}		20	V
Input voltage (LIN, HIN, EN)	U_{IN}		10	V
Output voltage (FAULT)	U_{OUT}		V_{CC}+0,5	V
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{op}		-40…+(Tjmax - 25)	°C
Isolation Properties				
Isolation voltage	V_{is}	t = 2 s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm
Comparative tracking index	CTI		>200	

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Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS}	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Input Rectifier Diode										
Forward voltage	V_F				7	25 125		1,04 0,97		V
Threshold voltage (for power loss calc. only)	V_{to}				7	25 125		0,87 0,74		V
Slope resistance (for power loss calc. only)	r_t				7	25 125		25 33		mΩ
Reverse current	I_r			1600		25 125			0,01	mA
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4W/mK						4,56		K/W
PFC IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0003	25 125	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		10	25 125		1,28 1,28	1,9	V
Collector-emitter cut-off	I_{CES}		0	650		25 125			0,04	mA
Gate-emitter leakage current	I_{GES}		20	0		25 125			120	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$		U_{CC} = 15 V	400	10	25 125		27 28		ns
Rise time	t_r					25 125		5 7		
Turn-off delay time	$t_{d(off)}$					25 125		122 154		
Fall time	t_f					25 125		2 2		
Turn-on energy loss	E_{on}					25 125		0,1516 0,2417		mWs
Turn-off energy loss	E_{off}					25 125		0,0317 0,0583		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		2100		pF
Output capacitance	C_{oss}							45		
Reverse transfer capacitance	C_{rss}							7,7		
Gate charge	Q_G		15	520	30	25		65		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4W/mK						4,96		K/W
PFC Inverse Diode										
Diode forward voltage	V_F				10	25 125	1,23	1,73 1,59	2,15	V
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4W/mK						9,56		K/W

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Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS}	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
PFC Diode										
Forward voltage	V_F				10	25 125		1,64 1,63	2,26	V
Reverse leakage current	I_{rm}			650		25			5	µA
Peak recovery current	I_{RRM}					25 125		15 19		A
Reverse recovery time	t_{rr}					25 125		22 36		ns
Reverse recovery charge	Q_{rr}		U_{CC} = 15 V	400	10	25 125		0,2008 0,4358		µC
Reverse recovered energy	E_{rec}					25 125		0,0150 0,0504		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		2033 891		A/µs
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4W/mK						5,48		K/W
PFC Shunt										
R1 value	R							50		mΩ
Inverter Transistor										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0002	25 125	4,4	5	5,6	V
Collector-emitter saturation voltage *	V_{CEsat}		15		10	25 125	1,7	2,20 2,32	2,95	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		25 125			0,1	mA
Turn-on delay time **	$t_{d(on)}$					25 125		582 631		
Rise time	t_r					25 125		20 25		ns
Turn-off delay time **	$t_{d(off)}$		U_{CC} = 15 V U_{IN} = 5 V	400	6	25 125		837 950		
Fall time	t_f					25 125		16 22		
Turn-on energy loss	E_{on}					25 125		0,1950 0,3241		mWs
Turn-off energy loss	E_{off}					25 125		0,1611 0,2042		
Input capacitance	C_{ies}							655		
Output capacitance	C_{oss}	f = 1 MHz	0	25		25		37		pF
Reverse transfer capacitance	C_{rss}							22		
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4W/mK						5,79		K/W

* chip data
** including gate driver

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Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS}	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Inverter Diode										
Diode forward voltage	V_F				10	25 125	1,5	2,23 2,18	2,85	V
Peak reverse recovery current	I_{RRM}					25 125		6 6		A
Reverse recovery time	t_{rr}					25 125		179 276		ns
Reverse recovered charge	Q_{rr}		U_{CC}=15V U_{IN}=5V	400	6	25 125		0,3566 0,6738		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		181 46		A/µs
Reverse recovered energy	E_{rec}					25 125		0,0867 0,1610		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4W/mK						6,66		K/W
DC - Shunt										
R2 value	R					25		25		mΩ
DC link Capacitor										
C value	C							100		nF
Gate Driver										
Supply voltage	V_{CC}					25	13	15	17,5	V
Quiescent Vcc supply current	I_{QCC}	U_{LIN} = 0 V; U_{HIN}=3,3 V				25		1,3	2	mA
Input voltage (LIN, HIN, EN)	V_{IN}					25	0		5	
Input voltage (GATE)	V_{GATE}					25	0		15	
Logic "0" input voltage (LIN, HIN)	V_{IH}	U_{CC} = 15 V				25	1,7	2,1	2,4	
Logic "1" input voltage (LIN, HIN)	V_{IL}					25	0,7	0,9	1,1	V
Positive going threshold voltage (EN)	$V_{EN,\ TH+}$					25	1,9	2,1	2,3	
Negative going threshold voltage (EN)	$V_{EN,\ TH-}$					25	1,1	1,3	1,5	
Input clamp voltage (LIN, HIN, EN)	$V_{IN,\ CLAMP}$	I_{IN} = 4 mA				25	9	10,3	12	
ITRIP positive going threshold	$V_{IT,\ TH+}$					25	380	445	510	mV
Input bias current LIN high	I_{LIN+}	U_{LIN} = 3,3 V				25		70	100	
Input bias current LIN low	I_{LIN-}	U_{LIN} = 0 V				25		110	200	
Input bias current HIN high	I_{HIN+}	U_{HIN} = 3,3 V				25		70	100	µA
Input bias current HIN low	I_{HIN-}	U_{HIN} = 0 V				25		110	120	
Input bias current EN high	I_{EN+}	U_{HIN} = 3,3 V				25		45	120	
Output voltage (FAULT)	V_{FLT}					25	0		U_{CC}	V
Low on resistor of pull down trans. (FAULT)	$R_{ON,\ FLT}$	U_{FAULT} = 0,5 V				25		45	100	Ω
Pulse width for ON or OFF	t_{IN}					25	1			µs
Turn-on propagation delay (LIN, HIN)	t_{ON}	$U_{LIN/HIN}$ = 0 V or 3,3 V				25	400	530	800	ns
Turn-off propagation delay (LIN, HIN)	t_{OFF}					25	360	490	760	
FAULT reset time	t_{RST}					25		4		ms
Fixed deadtime between high and low side	t_{DT}	$U_{LIN/HIN}$ = 0 V & 3,3 V				25	150	310		ns

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Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS}	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22000		Ω
Deviation of R_{100}	$\Delta R/R$	R_{100} = 1486 Ω				100	-12		12	%
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	

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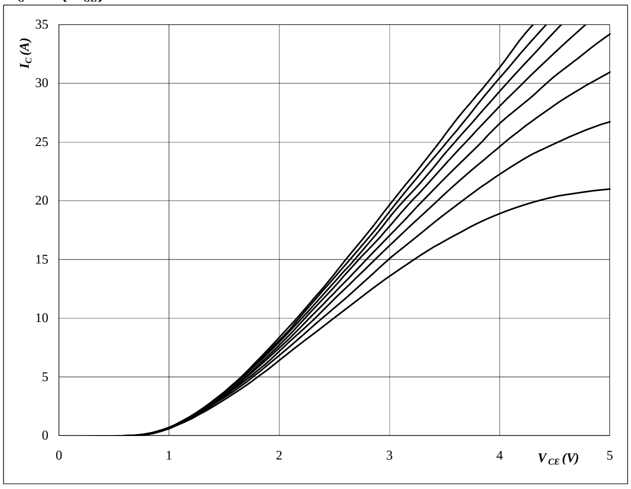
Output Inverter

Figure 1 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



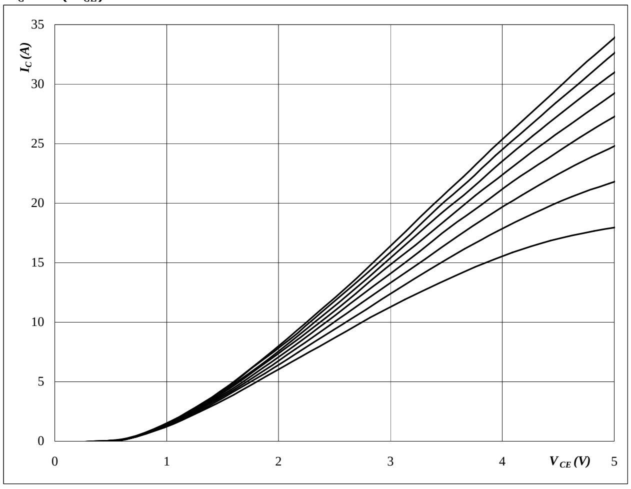
At

t_p =	250	µs
T_j =	25	°C
U_{CC} from	10 V to 17 V in steps of 1 V	

Figure 2 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



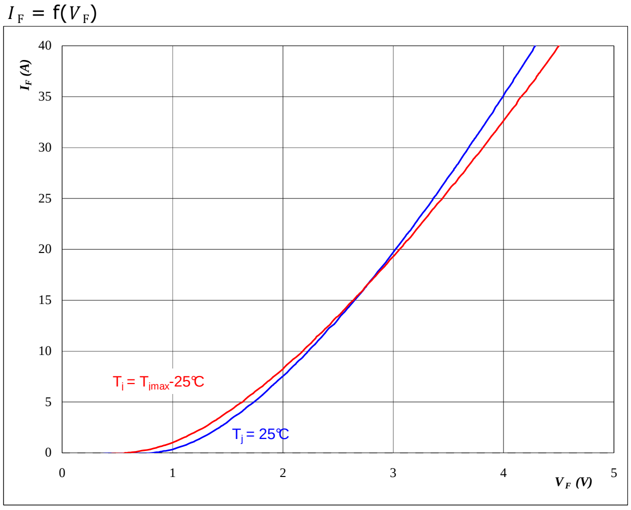
At

t_p =	250	µs
T_j =	125	°C
U_{CC} from	10 V to 17 V in steps of 1 V	

Figure 3 Output inverter FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p =	250	µs

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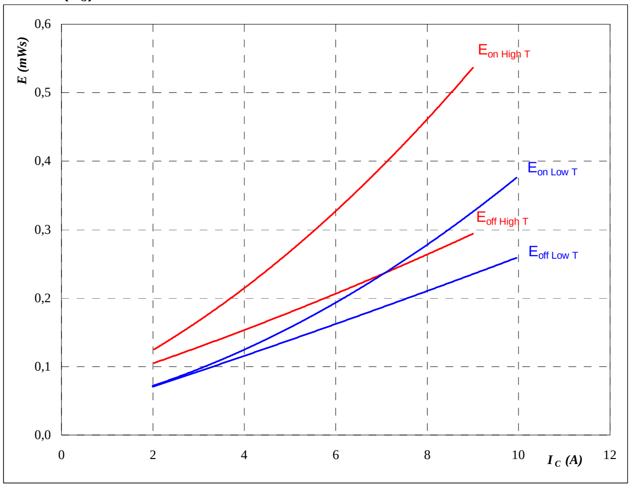
Output Inverter

Figure 4	Output inverter IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



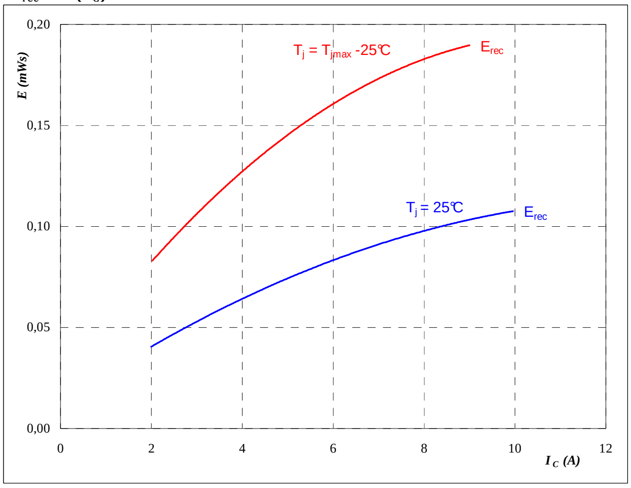
With an inductive load at

T_j =	25/125	°C
V_{CE} =	400	V
U_{CC}	15	V

Figure 5	Output inverter FWD

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
U_{CC}	15	V

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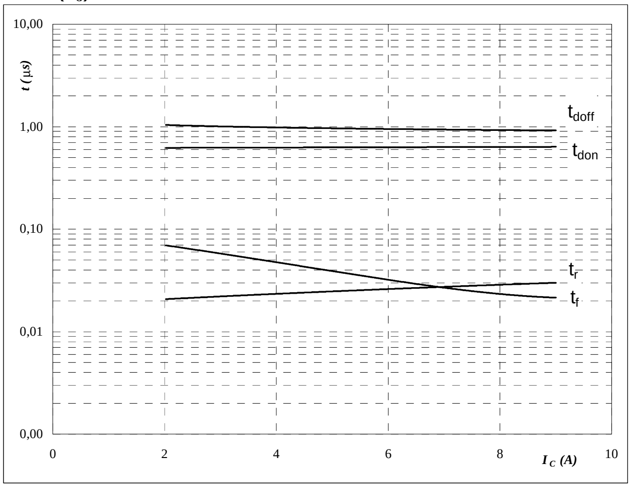
Output Inverter

Figure 6 Output inverter IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



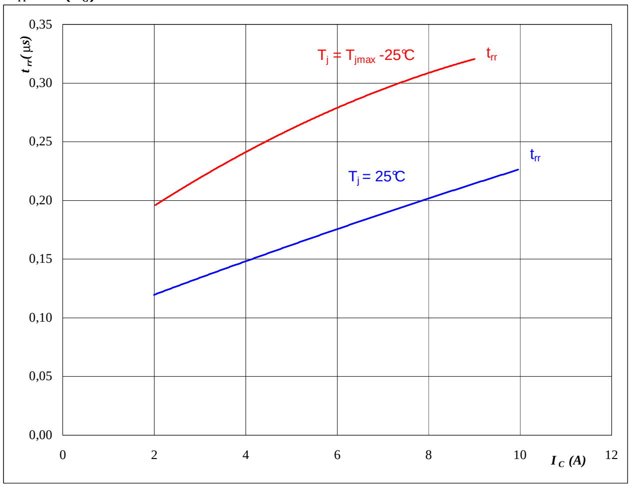
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
U_{CC}	15	V

Figure 7 Output inverter FWD

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
U_{CC}	15	V

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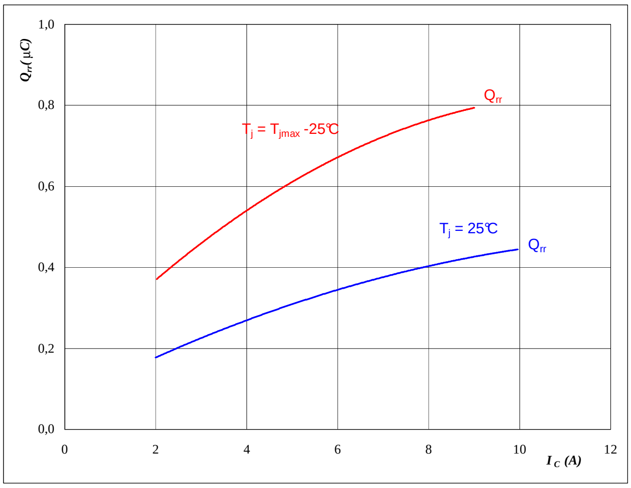
Output Inverter

Figure 8 Output inverter FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



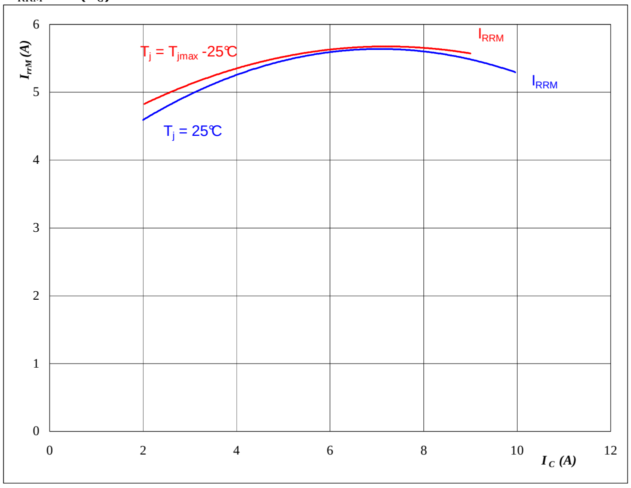
At

T_j =	25/125	°C
V_{CE} =	400	V
U_{CC}	15	V

Figure 9 Output inverter FWD

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
U_{CC}	15	V

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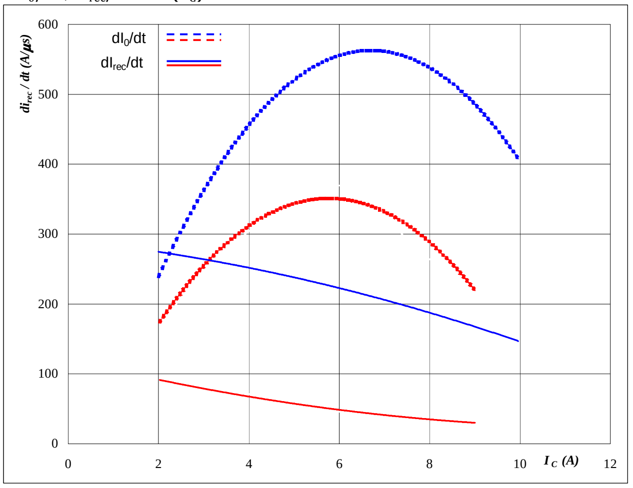
Output Inverter

Figure 10 Output inverter FWD

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

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



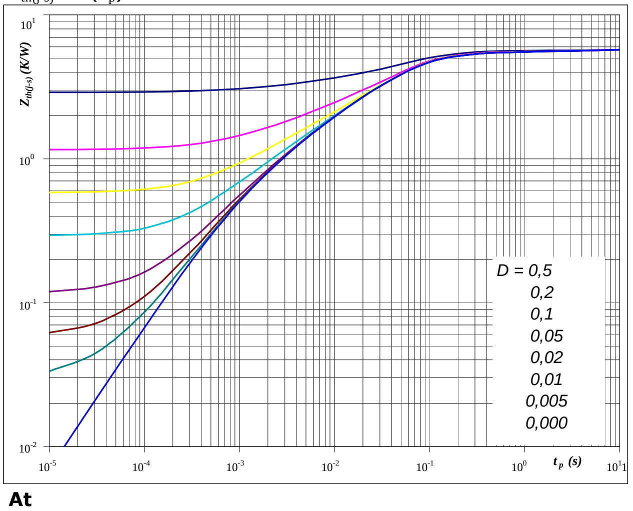
At

T_j =	25/125	°C
V_{CE} =	400	V
U_{CC}	15	V

Figure 11 Output inverter IGBT

IGBT transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	5,79	K/W

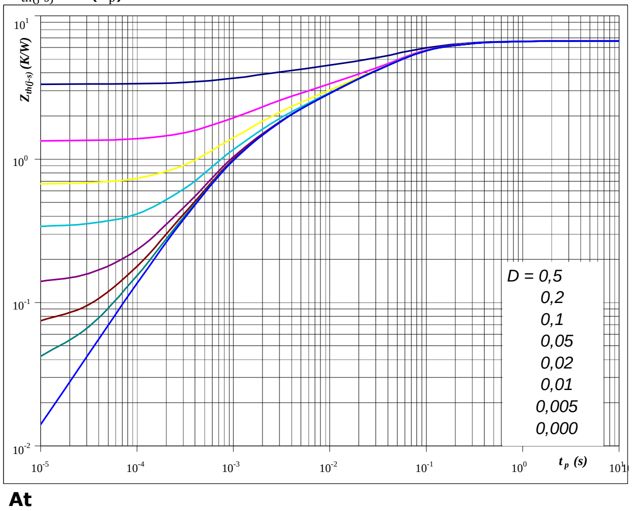
IGBT thermal model values

R (K/W)	Tau (s)
0,30	6,6E+00
0,61	2,1E-01
3,21	4,9E-02
0,84	1,0E-02
0,56	2,9E-03
0,26	7,4E-04

Figure 12 Output inverter FWD

FWD transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	6,66	K/W

FWD thermal model values

R (K/W)	Tau (s)
0,62	3,1E-01
3,07	5,4E-02
0,76	2,3E-02
1,19	4,7E-03
0,95	9,8E-04
0,08	7,5E-04

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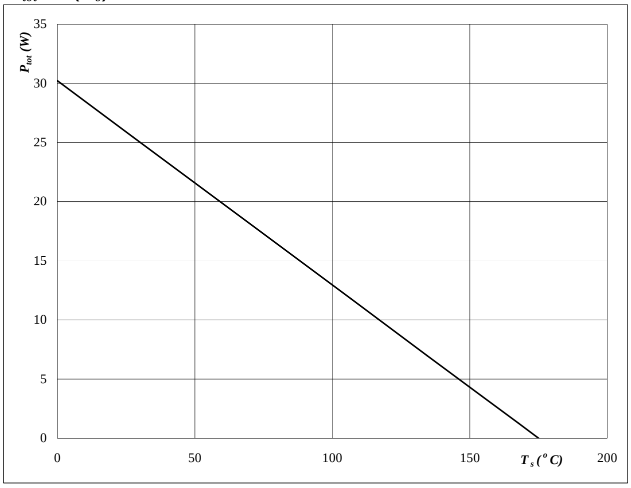
Output Inverter

Figure 13 Output inverter IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



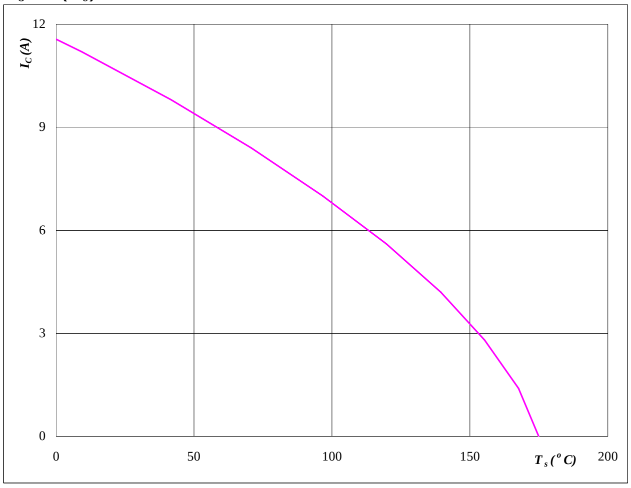
At

T_j = 175 °C

Figure 14 Output inverter IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

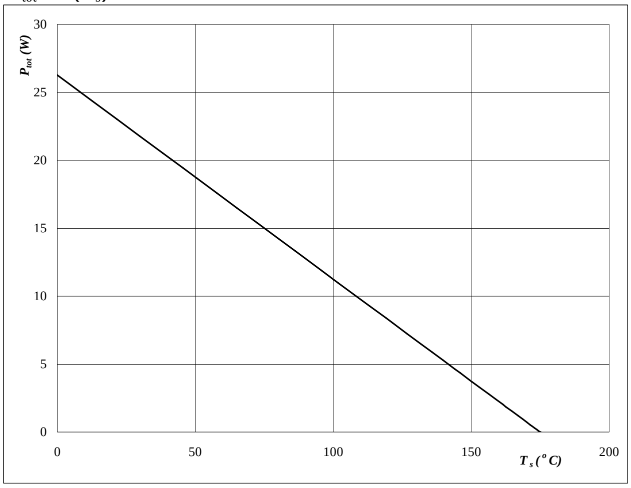
T_j = 175 °C

U_{CC} 15 V

Figure 15 Output inverter FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



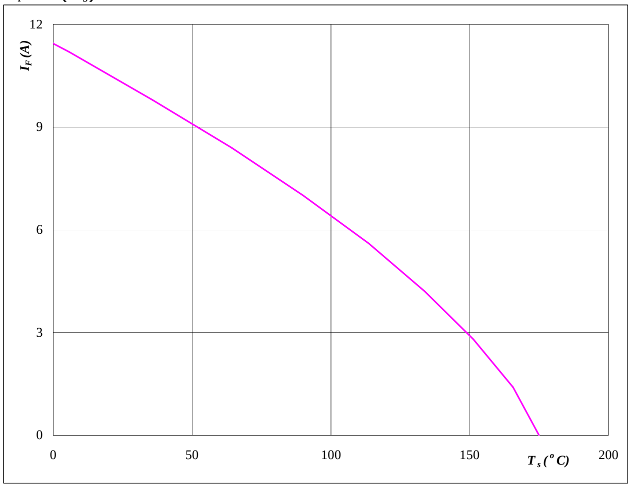
At

T_j = 175 °C

Figure 16 Output inverter FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

T_j = 175 °C

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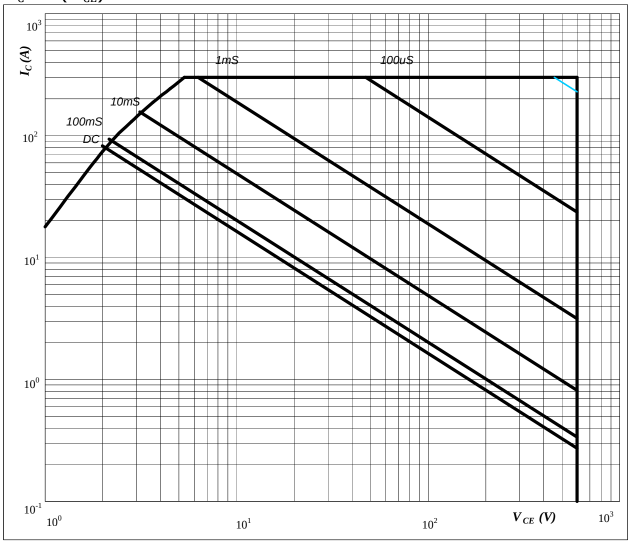
Output Inverter

Figure 17	Output inverter IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



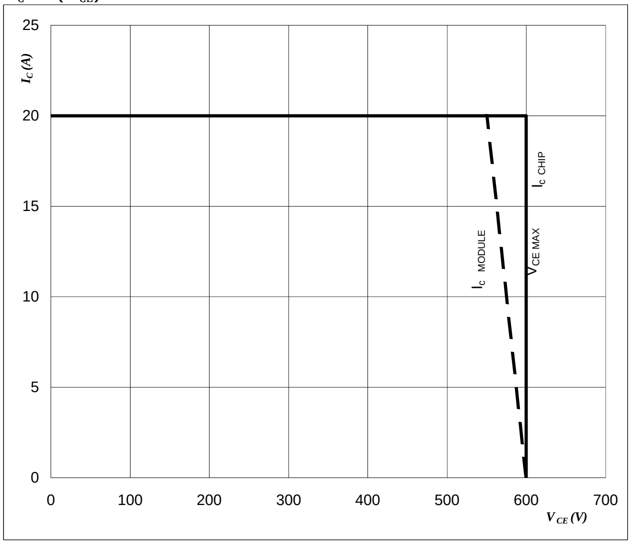
At

U_{CC}	15	V
T_j =	T_{jmax}	ºC

Figure 18	Output inverter IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	T_{jmax}-25	ºC

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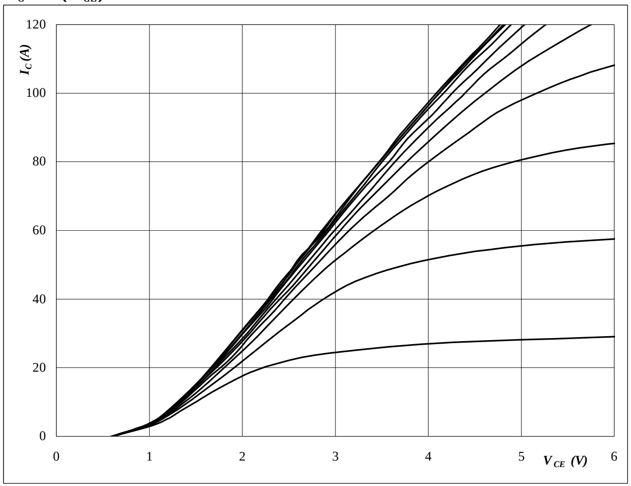
PFC

Figure 1 PFC IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

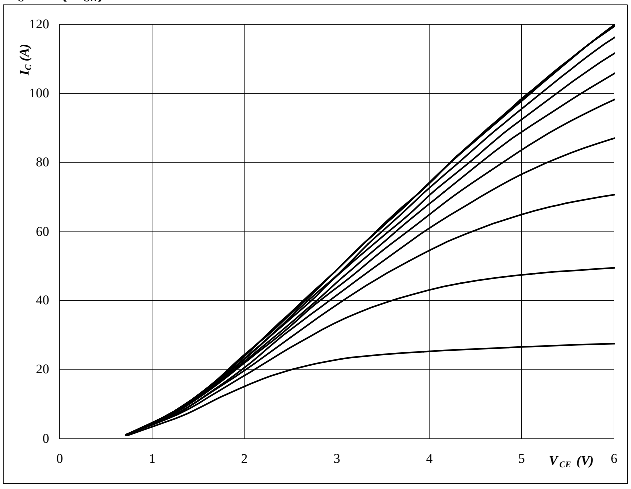
T_j = 25 °C

U_{CC} from 7 V to 17 V in steps of 1 V

Figure 2 PFC IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

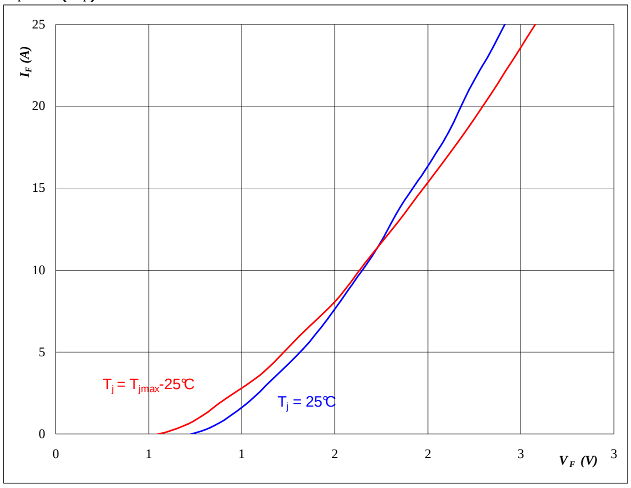
T_j = 125 °C

U_{CC} from 7 V to 17 V in steps of 1 V

Figure 3 PFC FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p = 250 µs

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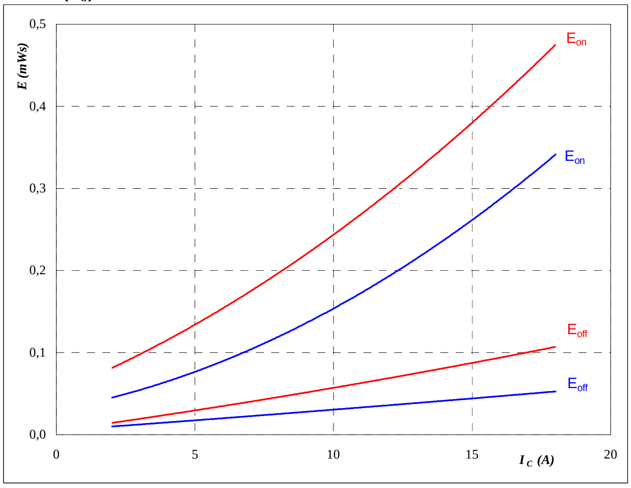
PFC

Figure 4 PFC IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



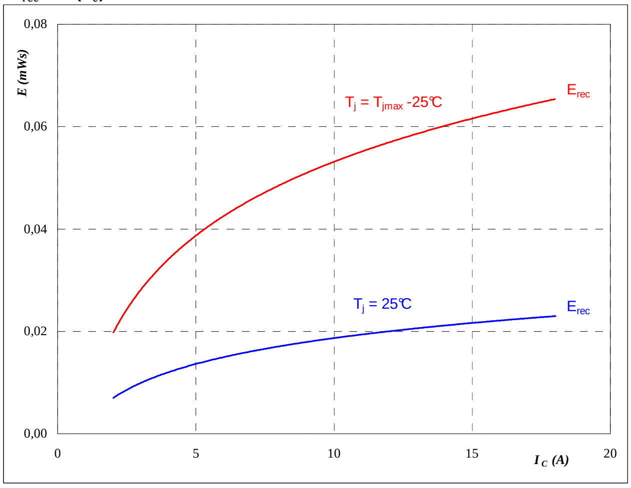
With an inductive load at

T_j =	25/125	°C
V_{CE} =	400	V
U_{CC} =	15	V

Figure 5 PFC IGBT

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
U_{CC} =	15	V

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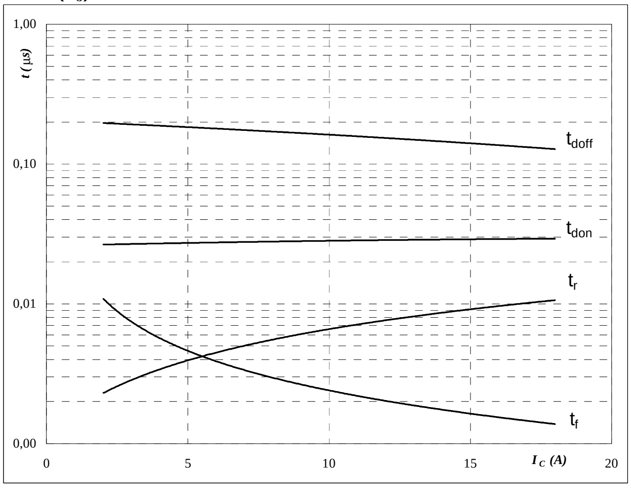
PFC

Figure 6 PFC IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



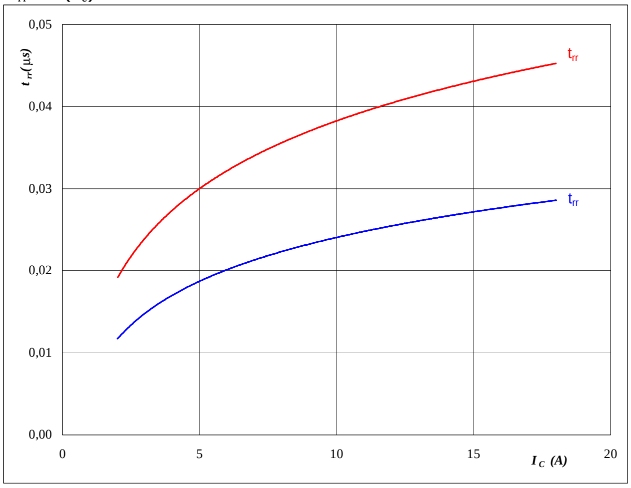
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
U_{CC} =	15	V

Figure 7 PFC FWD

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
U_{CC} =	15	V

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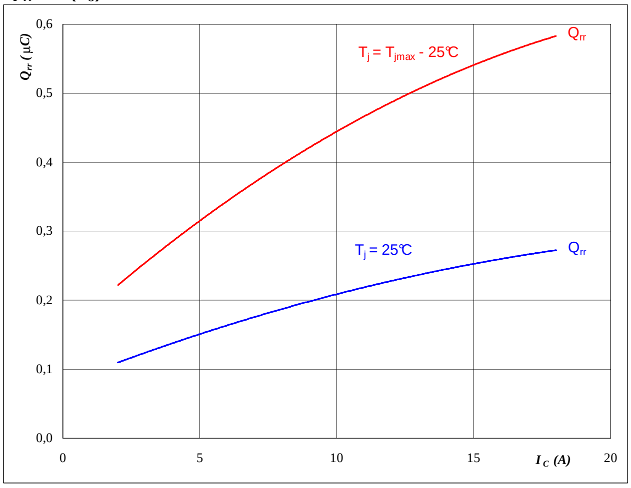
PFC

Figure 8 PFC FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



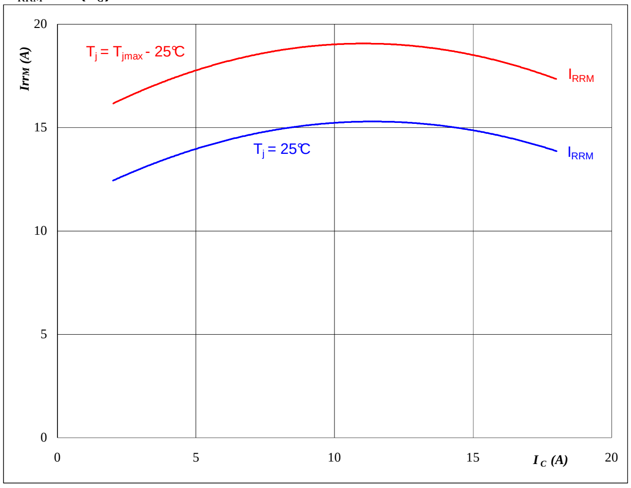
At

T_j =	25/125	°C
V_{CE} =	400	V
U_{CC} =	15	V

Figure 9 PFC FWD

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
U_{CC} =	15	V

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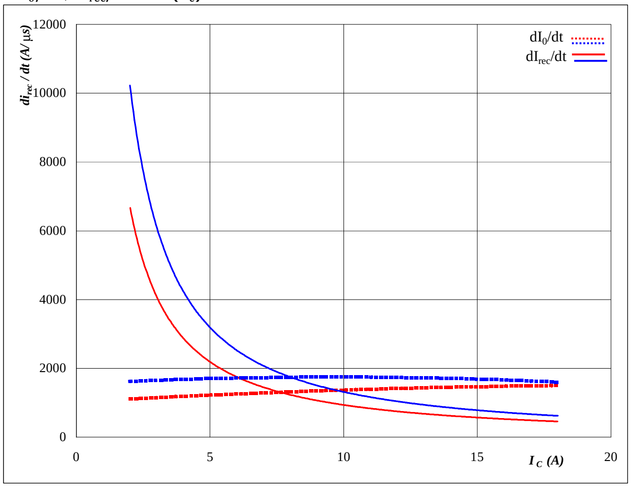
PFC

Figure 10 PFC FWD

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

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



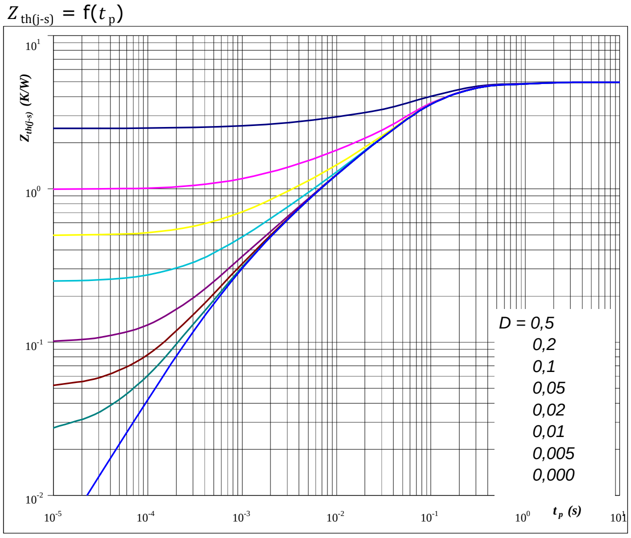
At

T_j =	25/125	°C
V_{CE} =	400	V
U_{CC} =	15	V

Figure 11 PFC IGBT

IGBT transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	4,96	K/W

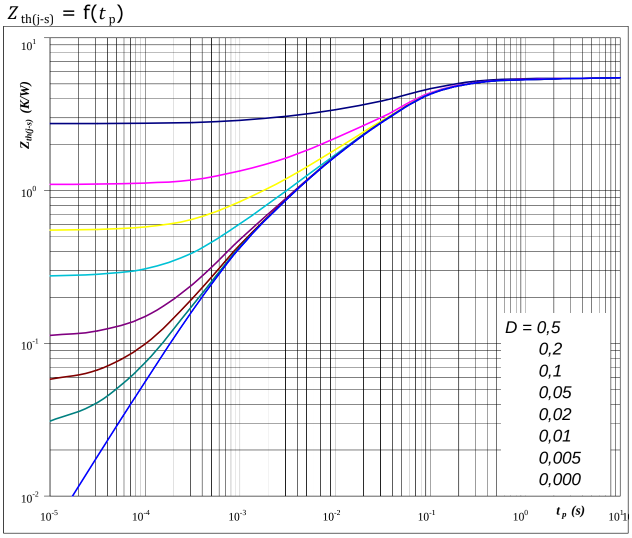
IGBT thermal model values

R (K/W)	Tau (s)
0,42	0,775
2,554	0,104
1,288	0,033
0,560	0,004
0,142	0,001

Figure 12 PFC FWD

FWD transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	5,48	K/W

FWD thermal model values

R (K/W)	Tau (s)
0,20	2,872
0,69	0,254
3,28	0,055
0,98	0,007
0,33	0,001

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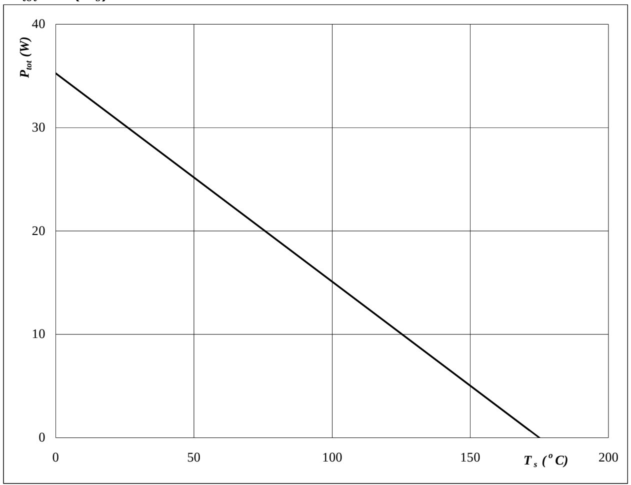
PFC

Figure 13 PFC IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



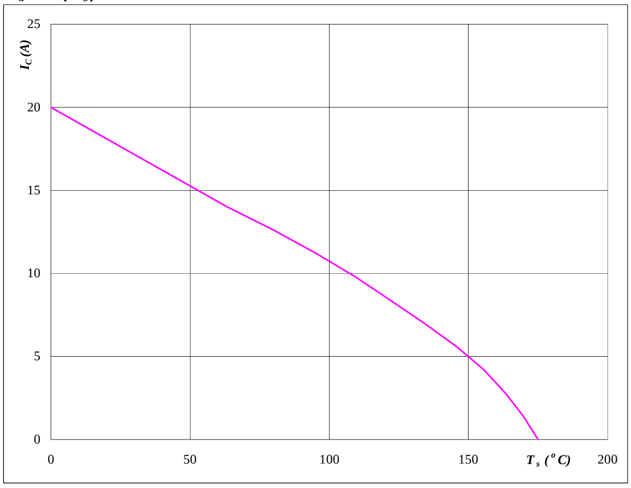
At

T_j = 175 ºC

Figure 14 PFC IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

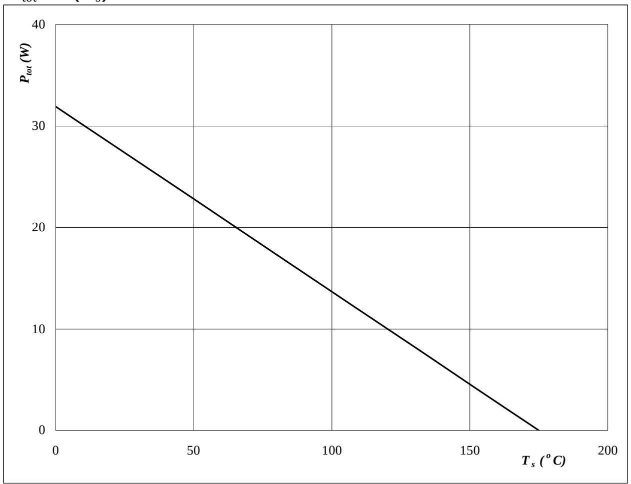
T_j = 175 ºC

U_{CC} = 15 V

Figure 15 PFC FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



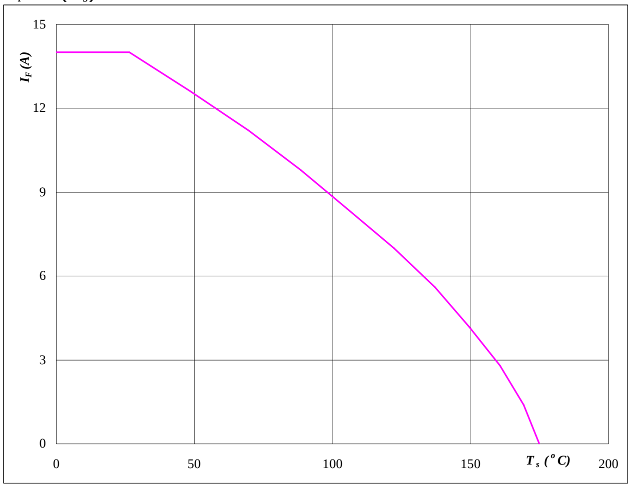
At

T_j = 175 ºC

Figure 16 PFC FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

T_j = 175 ºC

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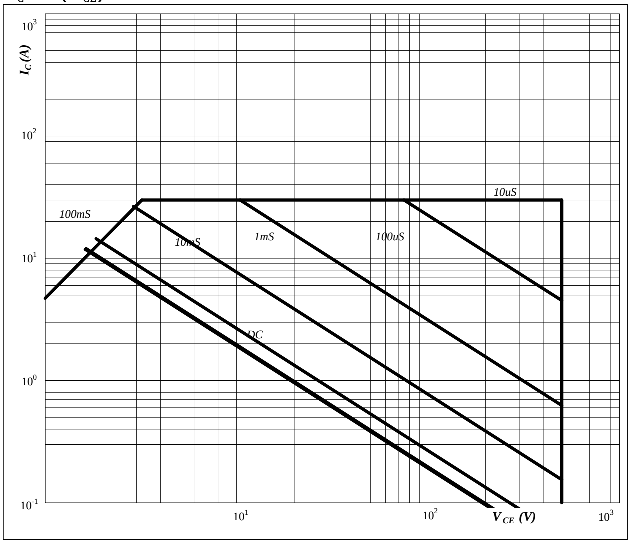
PFC

Figure 17 PFC IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



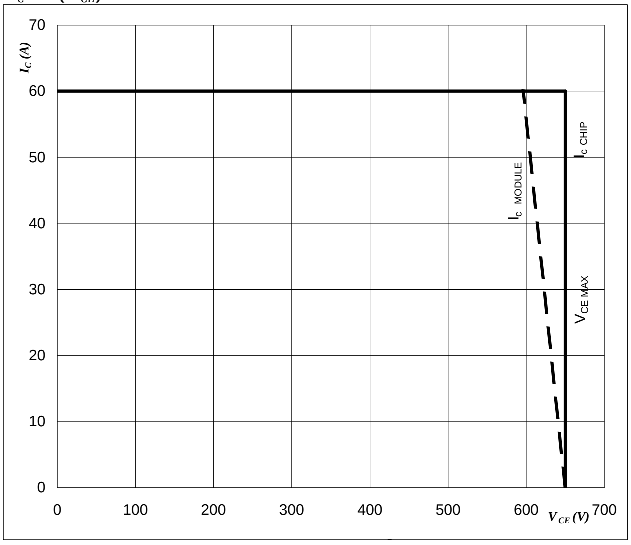
At

D =	single pulse	
T_s =	80	ºC
U_{CC} =	15	V
T_j =	T_{jmax}	

Figure 18 PFC IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = T_{jmax}-25 ºC

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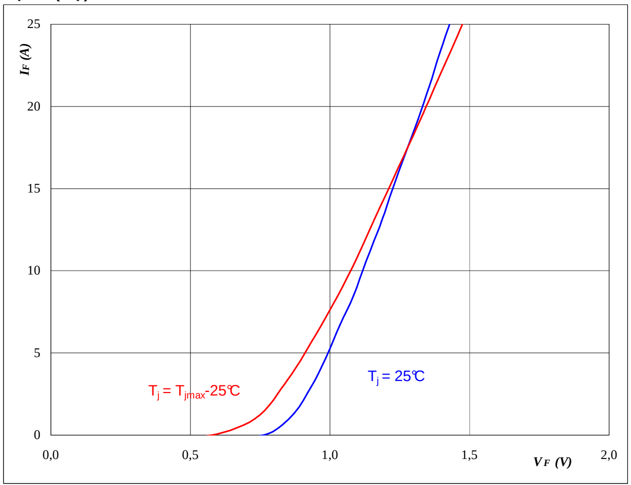
Input Rectifier Diode

Figure 1 Rectifier Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



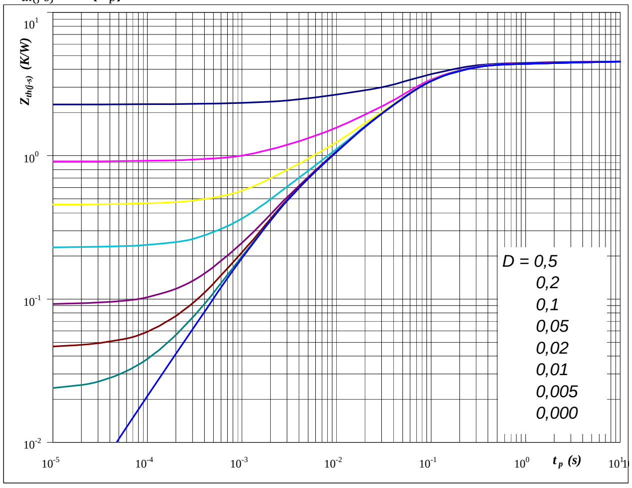
At

t_p = 250 µs

Figure 2 Rectifier Diode

Diode transient thermal impedance as a function of pulse width

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



At

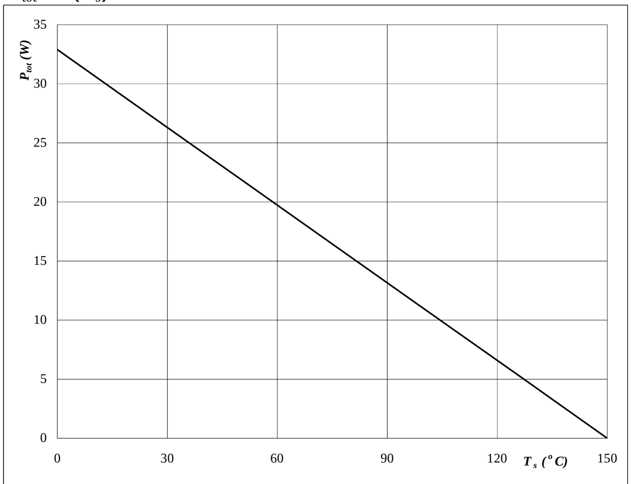
$D = t_p / T$

$R_{th(j-s)}$ = 4,56 K/W

Figure 3 Rectifier diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



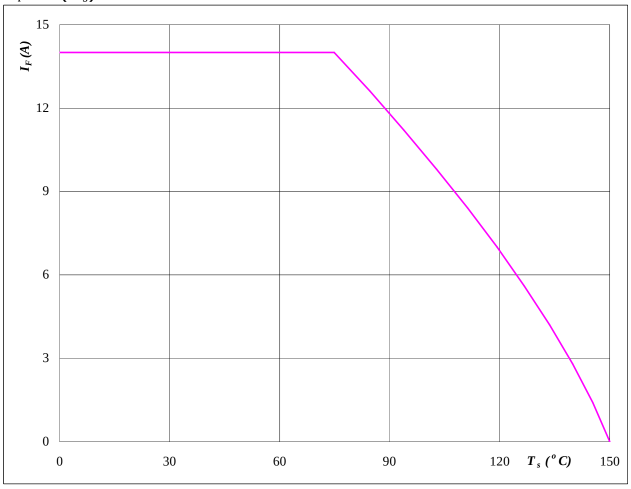
At

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

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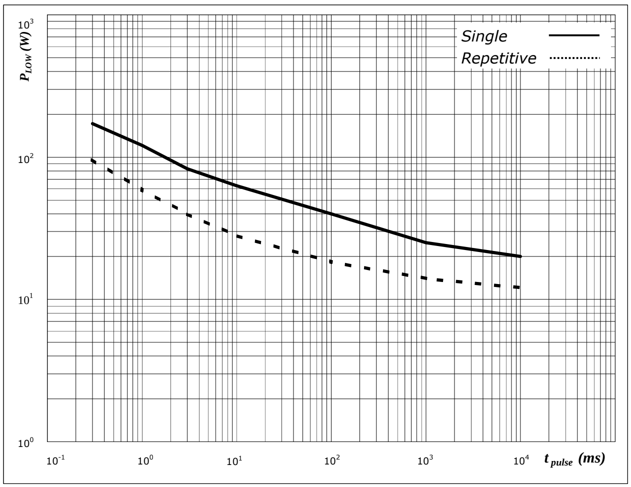
Shunt

Figure 1 PFC Shunt

Pulse Power R1

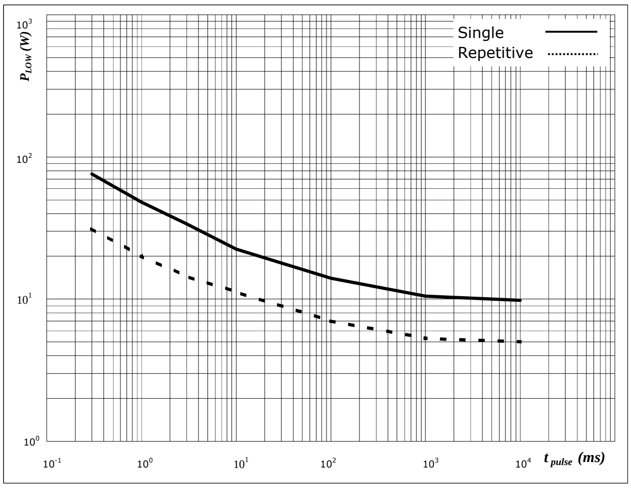


—— dR/R_0 < 5% after 1 pulse

.... dR/R_0 < 5% after 10.000 cycles; duty cycle< 0,1%

Figure 2 DC Shunt

Pulse Power R2



—— dR/R_0 < 1% after 1 pulse

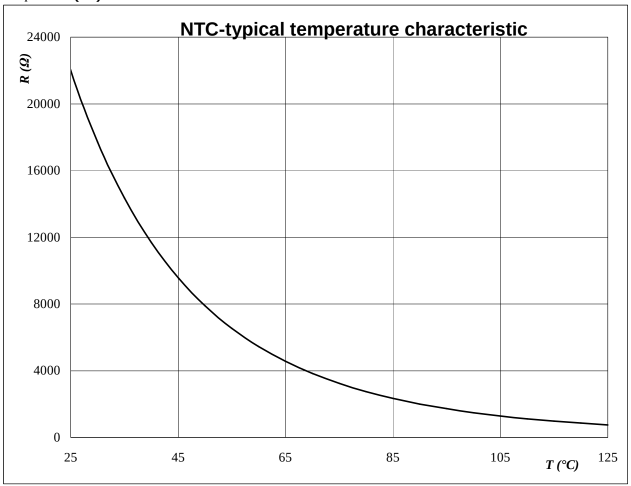
.... dR/R_0 < 1% after 10.000 cycles; duty cycle< 0,1%

Thermistor

Figure 1 Thermistor

Typical NTC characteristic
as a function of temperature

R_T = f(T)



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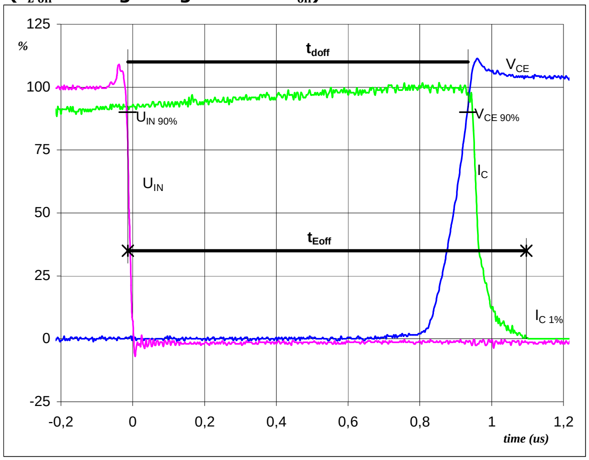
Switching Definitions Output Inverter

General conditions		
T_j	=	125 °C

Figure 1 Output inverter IGBT

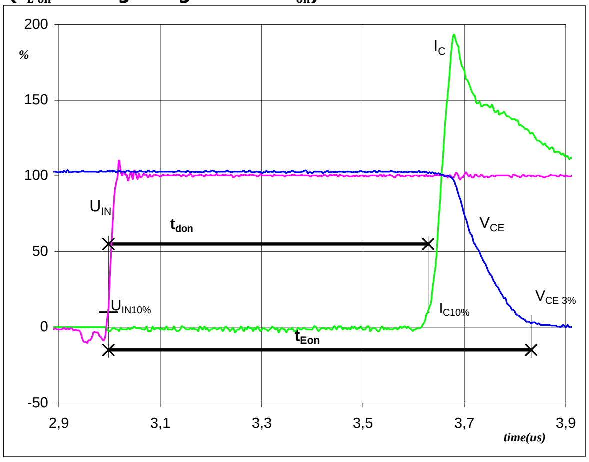
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



U_{IN} (0%) =	0	V
U_{IN} (100%) =	5	V
V_C (100%) =	400	V
I_C (100%) =	6	A
t_{doff} =	0,95	µs
$t_{E\,off}$ =	1,11	µs

Figure 2 Output inverter IGBT

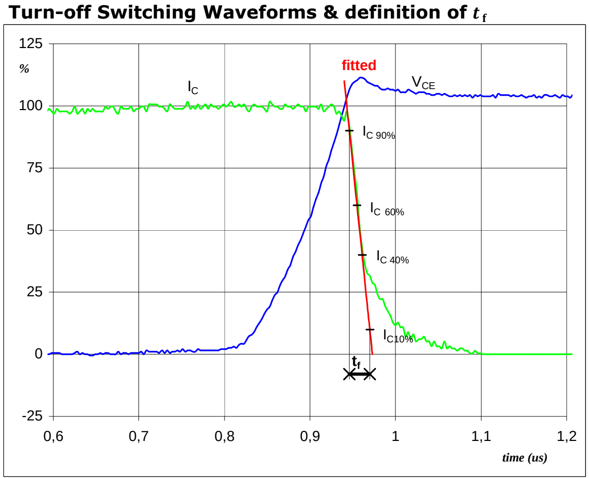
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



U_{IN} (0%) =	0	V
U_{IN} (100%) =	5	V
V_C (100%) =	400	V
I_C (100%) =	6	A
t_{don} =	0,63	µs
$t_{E\,on}$ =	0,83	µs

Figure 3 Output inverter IGBT

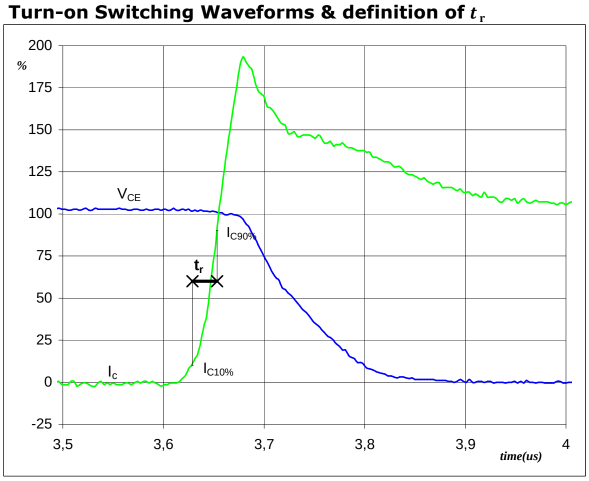
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	400	V
I_C (100%) =	6	A
t_f =	0,02	µs

Figure 4 Output 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

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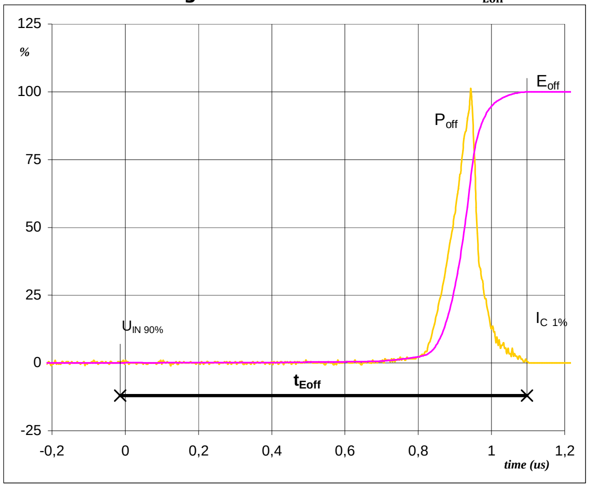
Switching Definitions Output Inverter

Figure 5 Output inverter IGBT

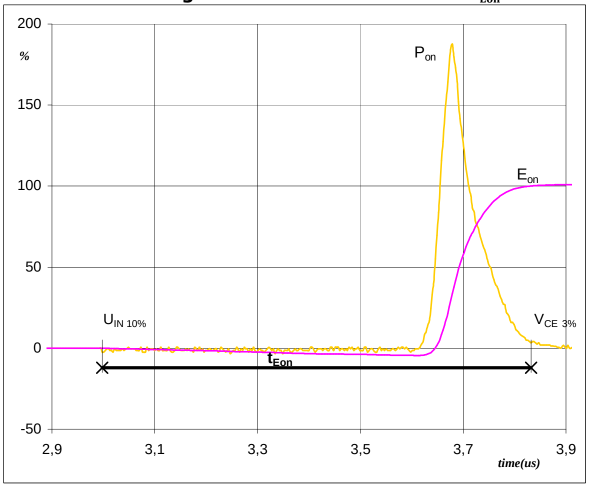
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	2,39	kW
E_{off} (100%) =	0,20	mJ
$t_{E\,off}$ =	1,11	µs

Figure 6 Output inverter IGBT

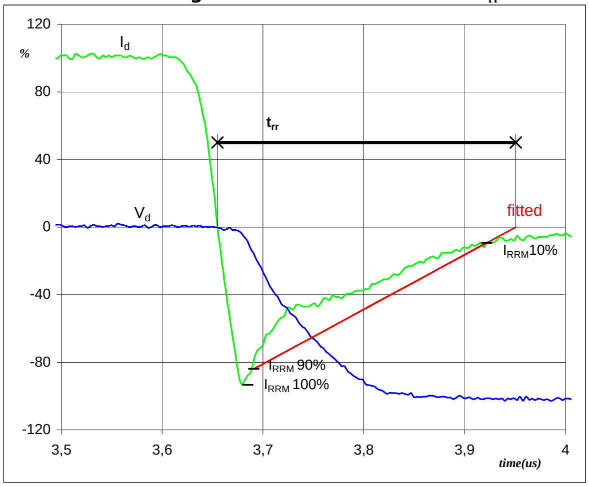
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	2,39	kW
E_{on} (100%) =	0,32	mJ
$t_{E\,on}$ =	0,83	µs

Figure 7 Output inverter FWD

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



V_d (100%) =	400	V
I_d (100%) =	6	A
I_{RRM} (100%) =	-6	A
t_{rr} =	0,28	µs

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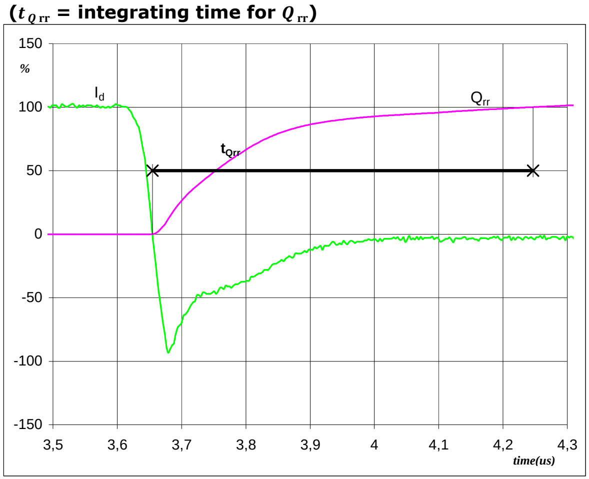
Switching Definitions Output Inverter

Figure 8 Output inverter FWD

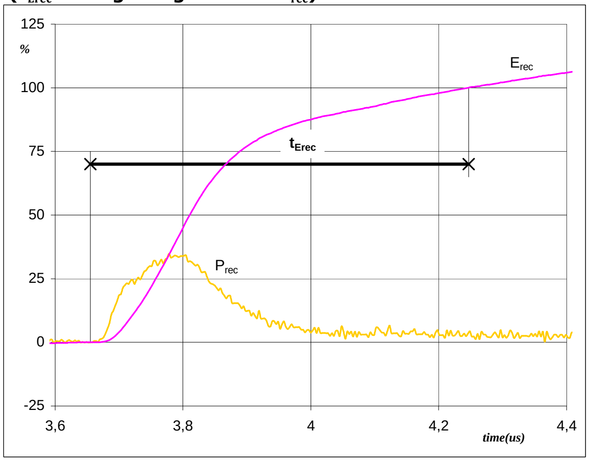
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	6	A
Q_{rr} (100%) =	0,67	μC
$t_{Q\,rr}$ =	0,59	μs

Figure 9 Output inverter FWD

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



P_{rec} (100%) =	2,39	kW
E_{rec} (100%) =	0,16	mJ
$t_{E\,rec}$ =	0,59	μs

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Application data

Static logic funtion table

V_{CC}	V_{BS}	RCIN	ITRIP	ENABLE	FAULT	LO1,2,3	HO1,2,3
$< V_{CCUV-}$	X	X	X	X	0	0	0
15V	$< V_{BSUV-}$	X	0	3.3V	High imp	/LIN1,2,3	0
15V	15V	<3.2V↓	0	3.3V	0	0	0
15V	15V	X	$> V_{IT,TH+}$	3.3V	0	0	0
15V	15V	$> V_{RCIN,TH}$	0	3.3V	High imp	/LIN1,2,3	/HIN1,2,3
15V	15V	$> V_{RCIN,TH}$	0	0	High imp	0	0

Pin Descriptions

Pin #	Pin Name	Pin Description
1	NTC2	Temperature sensor connector 1
2	NTC1	Temperature sensor connector 2
3	InvS +	Inverter sense resistor high-side
4	InvS -	Inverter sense resistor low-side
5	EN	Enable I/O functionality
6	¬Fault	Fault output, indicates over current or under voltage (negative logic, open-drain output)
7	¬LIN3	Signal input for low-side W phase
8	¬LIN2	Signal input for low-side V phase
9	¬LIN1	Signal input for low-side U phase
10	¬HIN3	Signal input for high-side W phase
11	¬HIN2	Signal input for high-side V phase
12	¬HIN1	Signal input for high-side U phase
13	V_{CC}	Driver circuit supply voltage
14	GND2	Inverter ground
15	GND	PFC gate driver GND
16	GATE	PFC Switch gate driver input
17	AC1	Rectifier input
18	AC2	Rectifier input
19	DC1 + (coil)	Rectifier output DC +
20	PFC + (coil)	PFC coil connector
21	DC1 -	Rectifier output DC -
22	PFC -	PFC return
23	DC2 -	Inverter input DC -
24	DC2 +	Inverter input DC +
25	W	Output for W phase
26	V	Output for V phase
27	U	Output for U phase

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Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

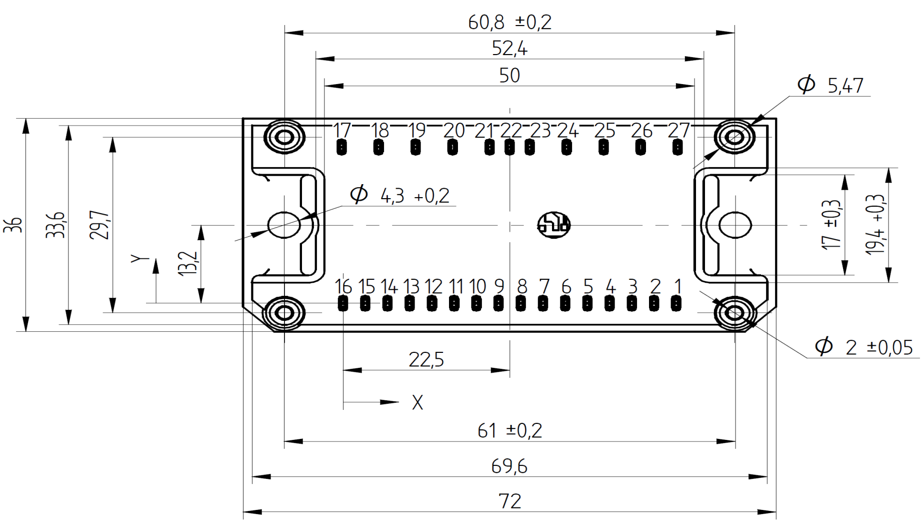
Version	Ordering Code
without thermal paste, solder pins	20-1B06IPB004RC01-P955A45
with thermal paste, solder pins	20-1B06IPB004RC01-P955A45-/3/
without thermal paste, press fit pins	20-PB06IPB004RC01-P955A45Y
with thermal paste, press fit pins	20-PB06IPB004RC01-P955A45Y-/3/

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

Outline

Pin table

Pin	X	Y	Function
1	45	0	NTC2
2	42	0	NTC1
3	39	0	Inv_S+
4	36	0	Inv_S-
5	33	0	EN
6	30	0	FAULT
7	27	0	LIN3
8	24	0	LIN2
9	21	0	LIN1
10	18	0	HIN3
11	15	0	HIN2
12	12	0	HIN1
13	9	0	VCC
14	6	0	GND2
15	3	0	GND
16	0	0	GATE
17	-0,2	26,4	AC1
18	4,8	26,4	AC2
19	9,8	26,4	DC1+
20	14,8	26,4	PFC+
21	19,8	26,4	DC1-
22	22,5	26,4	PFC-
23	25,2	26,4	DC2-
24	30,2	26,4	DC2+
25	35,2	26,4	W
26	40,2	26,4	V
27	45,2	26,4	U



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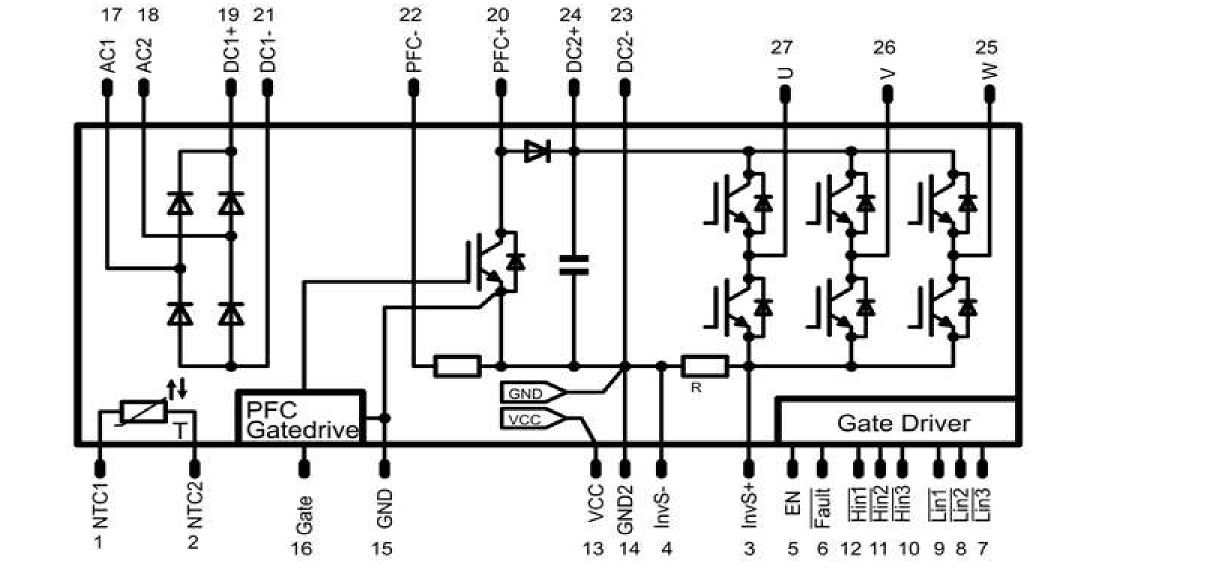
Ordering Code and Marking - Outline - Pinout

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	600 V	10 A	Inverter Transistor	
T7	IGBT	650 V	30 A	PFC IGBT	
D12	FWD	650 V	30 A	PFC Diode	
D11	FWD	650 V	6 A	PFC Inverse Diode	
R3	Resistor			PFC Shunt	
D7,D8,D9,D10	Rectifier	1600 V	12 A	Input Rectifier Diode	
R2	Resistor			DC Shunt	
C1	Capacitor	500 V		DC Link Capacitor	
T	Thermistor			Thermistor	

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Packaging instruction					
Standard packaging quantity (SPQ)	**100**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 1B packages see vincotech.com website.

Package data
Package data for *flow* 1B 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
20-xB06IPB004RC01-P955A45x-D6-14	31 Jan. 2017	Correction condition values	4-6

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As used herein:

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 la

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.

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