10-P006PPA010SB-M683BY

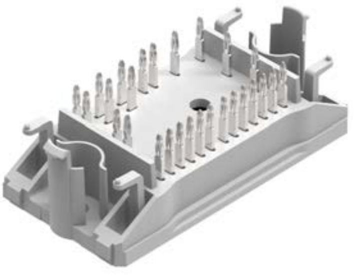
datasheet

***flow*PIM 0 + PFC** | **600 V / 10 A**

Features

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

flow 0 17 mm housing



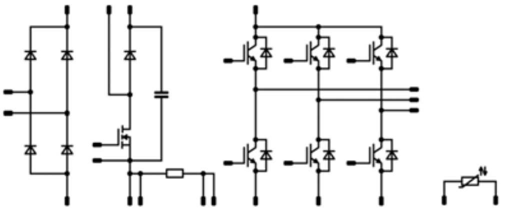
Target applications

- Industrial Drives
- Embedded Drives

Types

- 10-P006PPA010SB-M683BY

Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Inverter Switch					
Collector-emitter voltage	V_{CES}			600	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	17	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	44	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 360 V	T_j = 150 °C	6	µs
Maximum junction temperature	T_{jmax}			175	°C
Inverter Diode					
Peak repetitive reverse voltage	V_{RRM}			600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	17	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	32	W
Maximum junction temperature	T_{jmax}			175	°C
PFC Switch					
Drain-source voltage	V_{DSS}			600	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$	T_s = 80 °C	18	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		112	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	72	W
Gate-source voltage	V_{GSS}			±20	V
Maximum Junction Temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
PFC Diode					
Peak repetitive reverse voltage	V_{RRM}			600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	54	W
Maximum junction temperature	T_{jmax}			175	°C
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	33	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	200	A
Surge current capability	I^2t			200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	44	W
Maximum junction temperature	T_{jmax}			150	°C
PFC Shunt					
DC current	I		T_c = 70 °C	15	A
Power dissipation	P_{tot}		T_c = 70 °C	5	W
Capacitor (PFC)					
Maximum DC voltage	V_{MAX}			500	V
Operation Temperature	T_{op}			-55 ... 125	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance				min. 12,7	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00015	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		10	25 125	1,1	1,59 1,78	1,9(1)	V
Collector-emitter cut-off current	I_{CES}		0	600		25			0,6	µA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		551		pF
Output capacitance	C_{oes}							40		pF
Reverse transfer capacitance	C_{res}							17		pF
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,15		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 32 Ω R_{goff} = 32 Ω	±15	400	10	25 125		75,2 74,4		ns
Rise time	t_r					25 125		23,8 25,8		ns
Turn-off delay time	$t_{d(off)}$					25 125		136 158,8		ns
Fall time	t_f					25 125		83,29 123,18		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,466 µC Q_{rFWD}=0,896 µC				25 125		0,277 0,376		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,33 0,449		mWs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Inverter Diode										
Static										
Forward voltage	V_F				10	25 125	1,25	1,58 1,52	1,95(1)	V
Reverse leakage current	I_R	V_r = 600 V				25			27	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,99		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=400 A/µs d*i*/d*t*=467 A/µs	±15	400	10	25 125		5,13 6,56		A
Reverse recovery time	t_{rr}					25 125		193,87 269,56		ns
Recovered charge	Q_r					25 125		0,466 0,896		µC
Reverse recovered energy	E_{rec}					25 125		0,132 0,255		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		21,2 64,56		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
PFC Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		10		18,1	25 125		99 199	99(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,00121	25	2,4	3	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			5	μA
Internal gate resistance	r_g							1,6		Ω
Gate charge	Q_g	V_{DD} = 480 V	0/10		18,1	25		119		nC
Short-circuit input capacitance	C_{iss}	f = 1 Mhz	0	100	0	25		2660		pF
Short-circuit output capacitance	C_{oss}							154		
Diode forward voltage	V_{SD}		0		18,1	25		0,9		V
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,97		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	0/10	400	10	25 125		19,8 22,8		ns
Rise time	t_r					25 125		4 4,2		ns
Turn-off delay time	$t_{d(off)}$					25 125		131,2 202,2		ns
Fall time	t_f					25 125		438 3,94		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,156 μC Q_{rFWD}=0,493 μC				25 125		0,083 0,147		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,023 0,045		mWs

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
PFC Diode										
Static										
Forward voltage	V_F				15	25 125		2,84 1,81	3,2(1)	V
Reverse leakage current	I_R	V_r = 600 V				25			50	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,75		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=2470 A/µs d*i*/d*t*=2378 A/µs	0/10	400	10	25 125		24,04 36,41		A
Reverse recovery time	t_{rr}					25 125		12,15 22,8		ns
Recovered charge	Q_r					25 125		0,156 0,493		µC
Reverse recovered energy	E_{rec}					25 125		0,024 0,106		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		8698 6331		A/µs
Rectifier Diode										
Static										
Forward voltage	V_F				8	25 125		0,996 0,907	1,21(1) 1,1(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25			50	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,59		K/W

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
PFC Shunt										
Static										
Resistance	R							20		mΩ
Tolerance							-1		1	%
Temperature coeficient	tc							50		ppm/K
Capacitor (PFC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		100		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P							5		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %						4000		K
Vincotech Thermistor Reference									I	

(1) Value at chip level

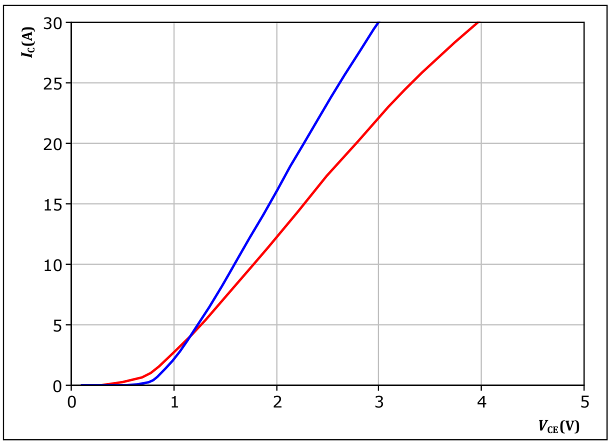
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

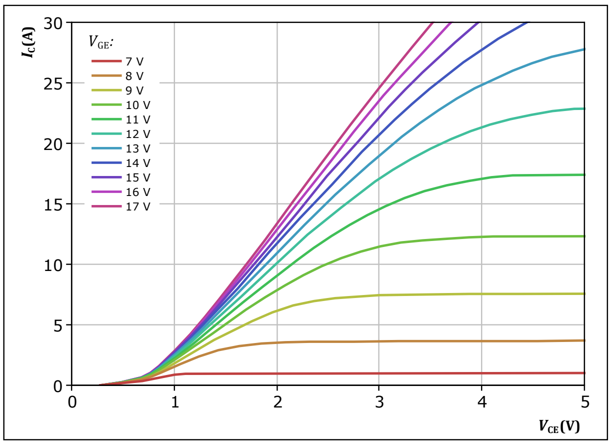


t_p =	250	µs	T_j:	25 °C
V_{GE} =	15	V		125 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



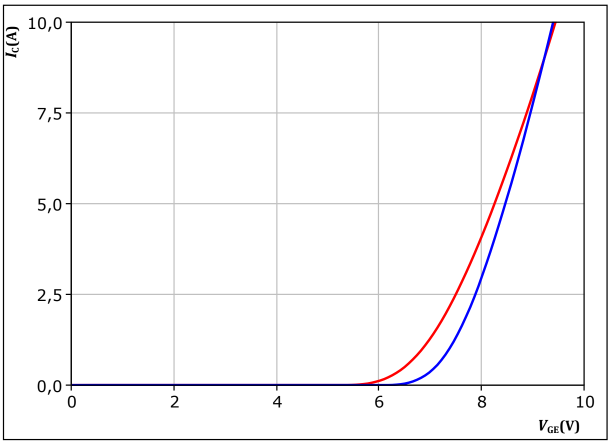
t_p =	250	µs
T_j =	125	°C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

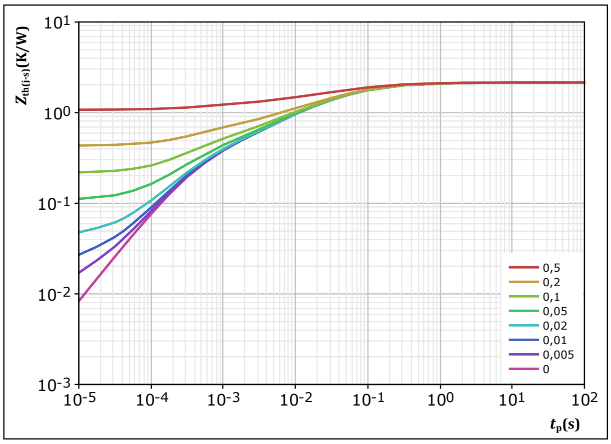


t_p =	250	µs	T_j:	25 °C
V_{CE} =	10	V		125 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 2,149 K/W

IGBT thermal model values

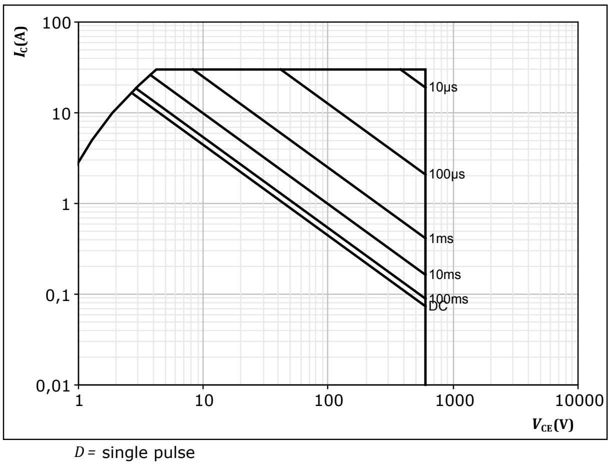
R (K/W)	τ (s)
1,04E-01	1,37E+00
2,88E-01	2,01E-01
6,99E-01	5,27E-02
4,91E-01	1,22E-02
3,07E-01	2,97E-03
2,60E-01	3,80E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})



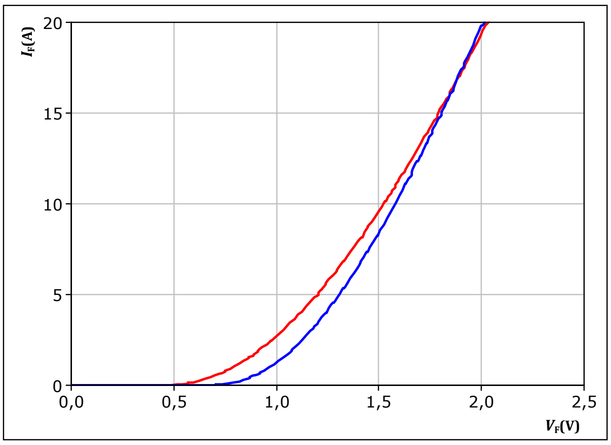
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



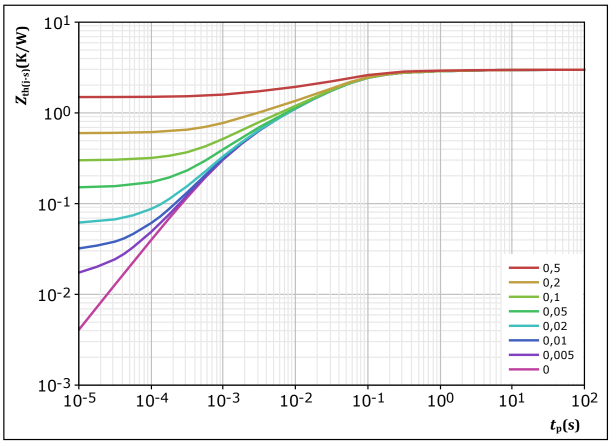
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 2,988 K/W

FWD thermal model values

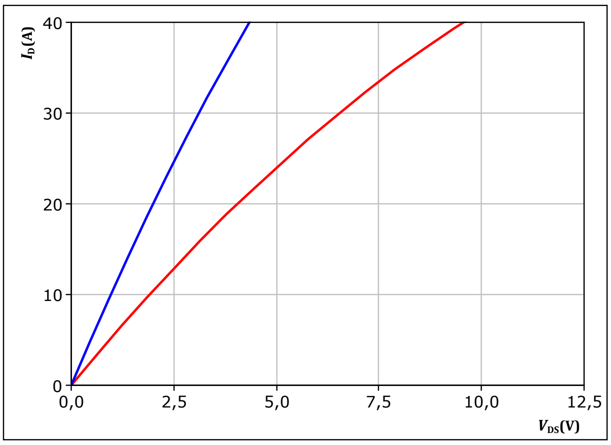
R (K/W)	τ (s)
8,74E-02	5,59E+00
2,41E-01	4,60E-01
1,22E+00	6,53E-02
6,89E-01	2,20E-02
4,52E-01	5,14E-03
2,99E-01	1,11E-03

PFC Switch Characteristics

figure 8. MOSFET

Typical output characteristics

I_D = f(V_{DS})

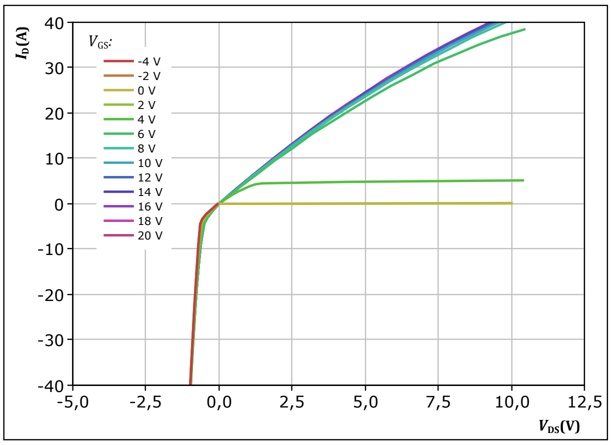


t_p =	250	µs	T_j:	25 °C
V_{GS} =	10	V		125 °C

figure 9. MOSFET

Typical output characteristics

I_D = f(V_{DS})



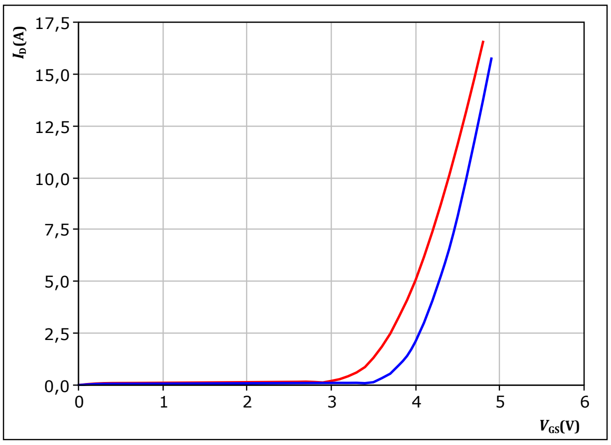
t_p =	250	µs
T_j =	125	°C

V_{GS} from -4 V to 20 V in steps of 2 V

figure 10. MOSFET

Typical transfer characteristics

I_D = f(V_{GS})

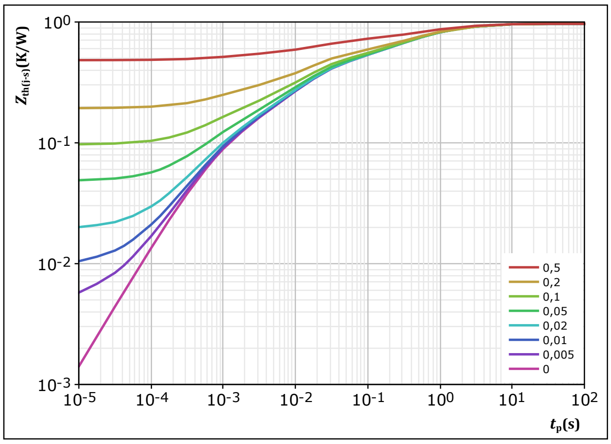


t_p =	250	µs	T_j:	25 °C
V_{DS} =	10	V		125 °C

figure 11. MOSFET

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j\text{-}s)}$ =	0,966	K/W

MOSFET thermal model values

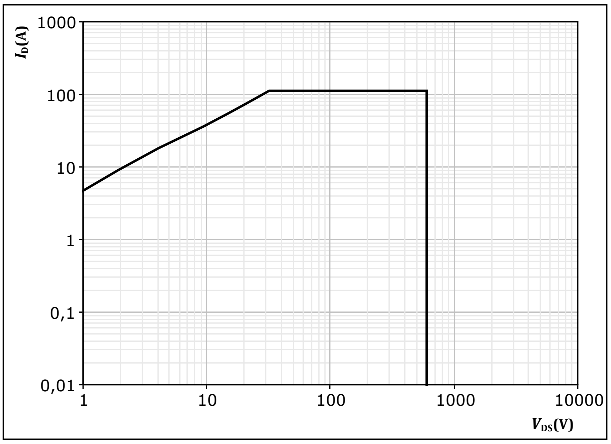
R (K/W)	τ (s)
1,06E-01	3,76E+00
2,45E-01	7,23E-01
1,88E-01	1,99E-01
2,87E-01	1,89E-02
7,02E-02	3,22E-03
7,08E-02	6,83E-04

PFC Switch Characteristics

figure 12. **MOSFET**

Safe operating area

I_D = f(V_{DS})



D = single pulse

T_s = 80 °C

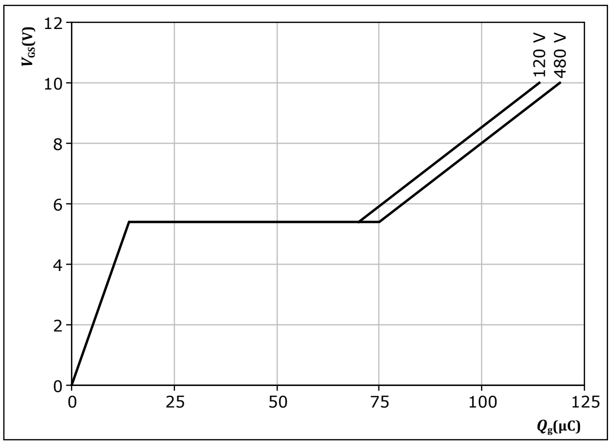
V_{GS} = 10 V

T_j = T_{jmax}

figure 13. **MOSFET**

Gate voltage vs gate charge

V_{GS} = f(Q_g)



I_D = 18.1 A

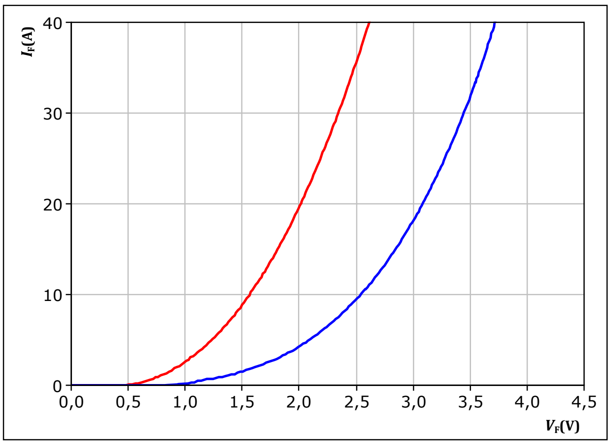
T_j = 25 °C

PFC Diode Characteristics

figure 14. **FWD**

Typical forward characteristics

I_F = f(V_F)



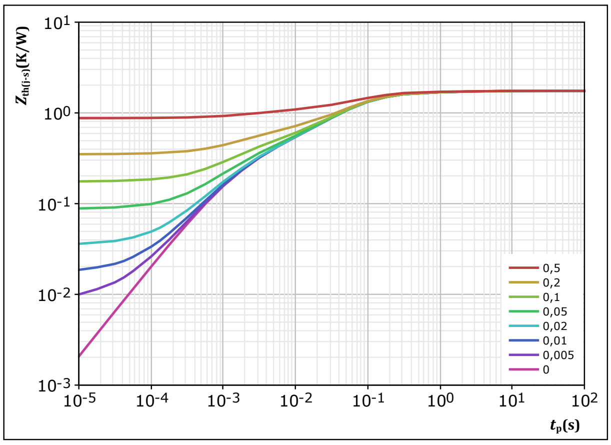
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 15. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,75 K/W

FWD thermal model values

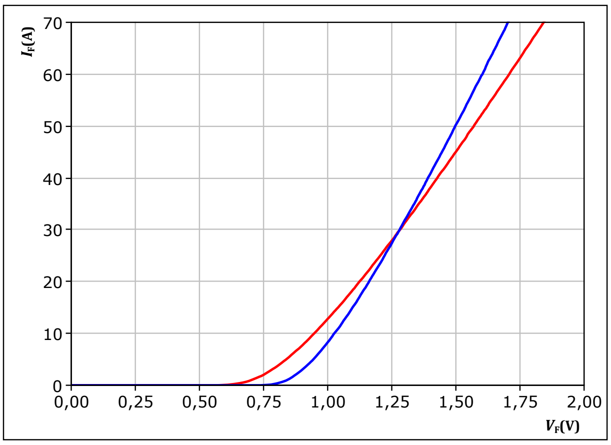
R (K/W)	τ (s)
4,94E-02	4,26E+00
1,24E-01	5,74E-01
7,20E-01	9,35E-02
4,86E-01	3,37E-02
1,96E-01	5,13E-03
1,76E-01	1,19E-03

Rectifier Diode Characteristics

figure 16. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



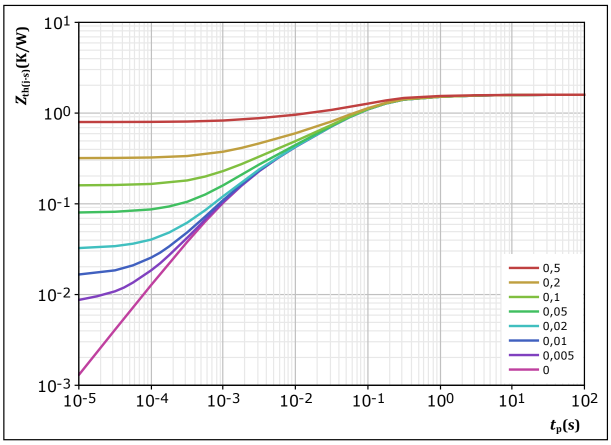
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 17. **Rectifier**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,594 K/W

Rectifier thermal model values

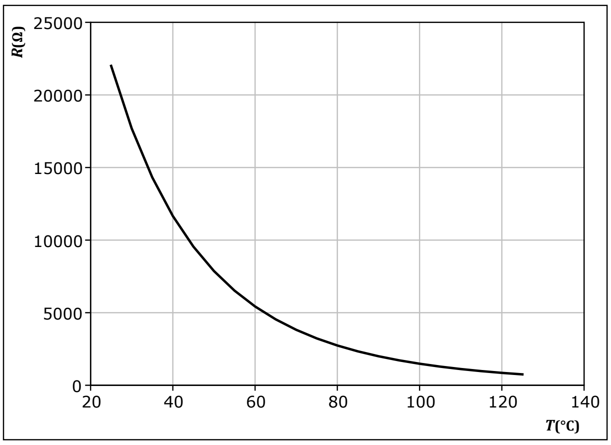
R (K/W)	τ (s)
3,44E-02	9,66E+00
1,12E-01	1,22E+00
5,81E-01	1,45E-01
4,89E-01	5,05E-02
2,38E-01	9,26E-03
1,22E-01	1,79E-03
1,81E-02	7,88E-04

Thermistor Characteristics

figure 18. **Thermistor**

Typical NTC characteristic as function of temperature

R_T = f(T)

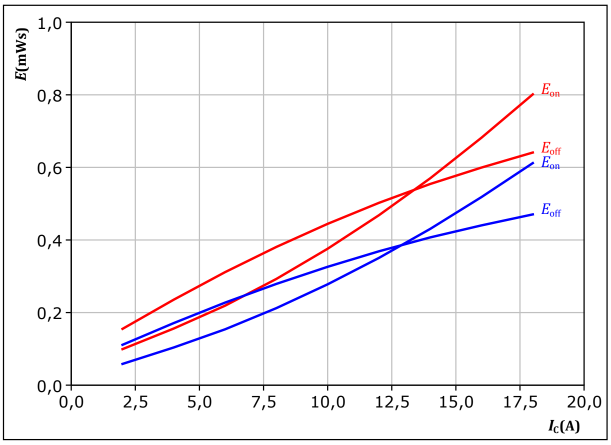


Inverter Switching Characteristics

figure 19. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



With an inductive load at

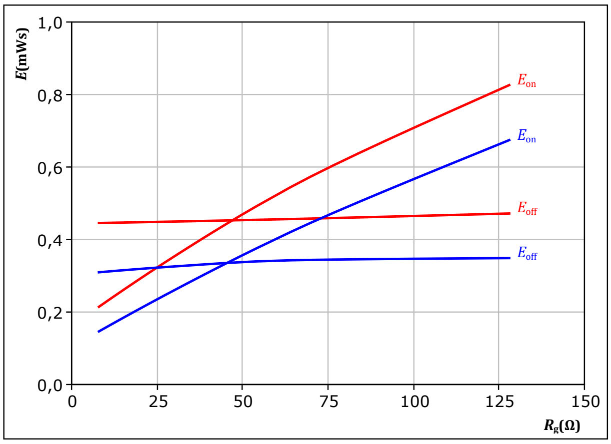
V_{CE} =	400	V	
V_{GE} =	±15	V	
R_{gon} =	32	Ω	
R_{goff} =	32	Ω	

T_j: 25 °C (blue), 125 °C (red)

figure 20. **IGBT**

Typical switching energy losses as a function of gate resistor

E = f(R_g)



With an inductive load at

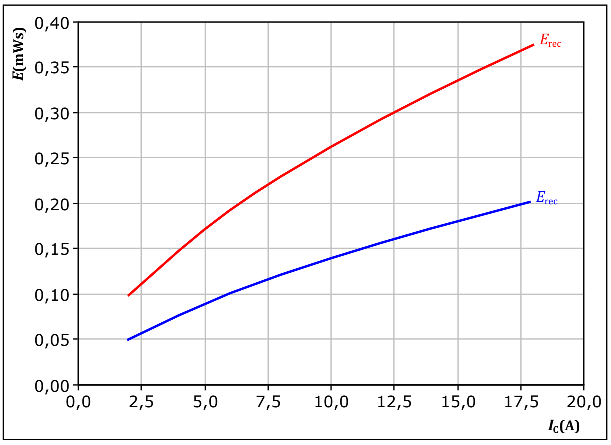
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	10	A

T_j: 25 °C (blue), 125 °C (red)

figure 21. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



With an inductive load at

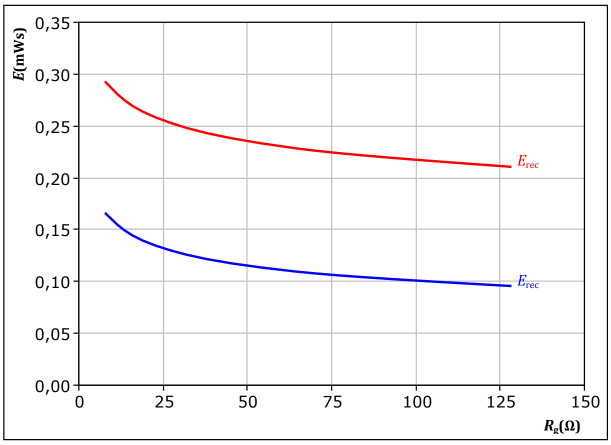
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	32	Ω

T_j: 25 °C (blue), 125 °C (red)

figure 22. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

E_{rec} = f(R_g)



With an inductive load at

V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	10	A

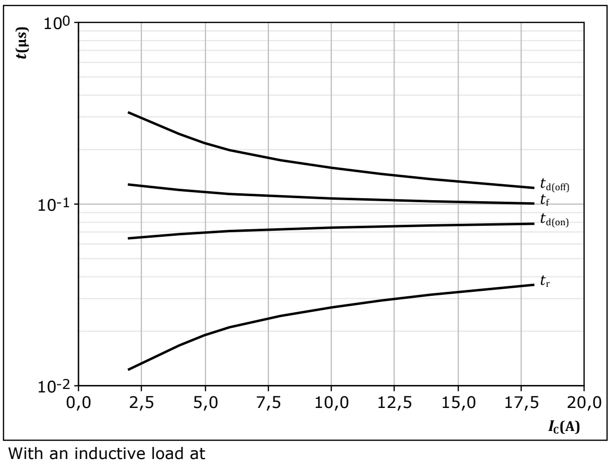
T_j: 25 °C (blue), 125 °C (red)

Inverter Switching Characteristics

figure 23. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



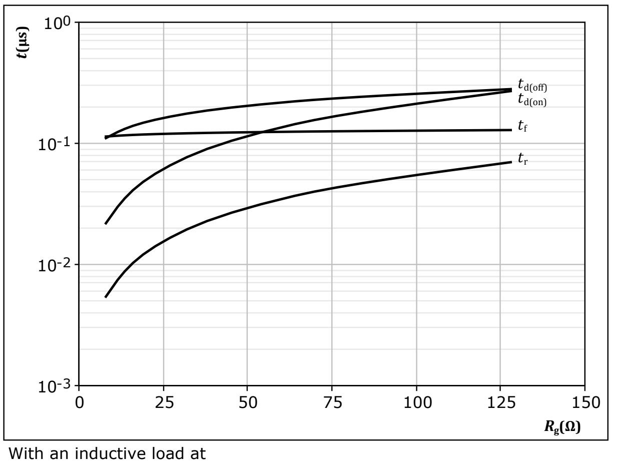
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	32	Ω
R_{goff} =	32	Ω

figure 24. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



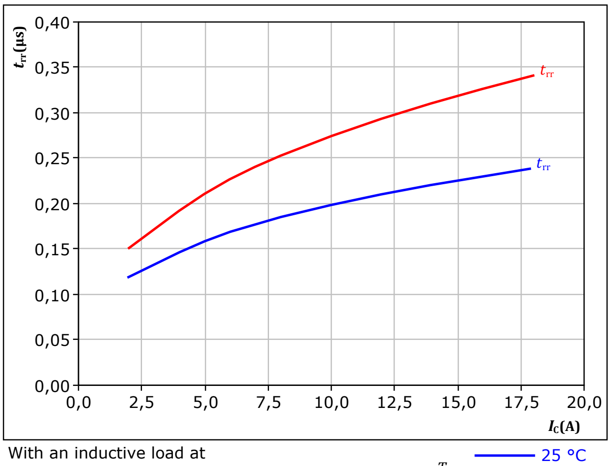
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	10	A

figure 25. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

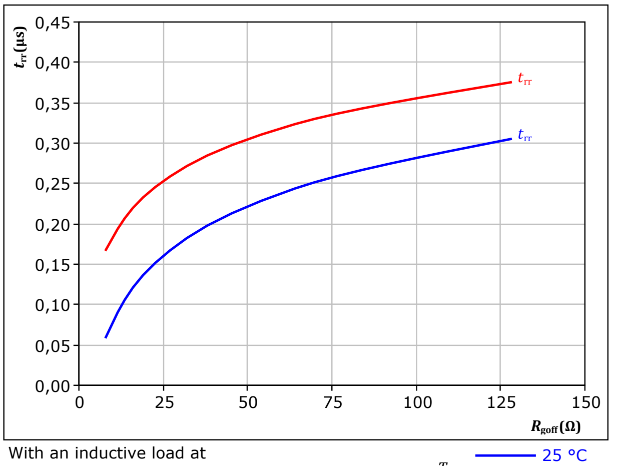
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	32	Ω

T_j: 25 °C, 125 °C

figure 26. **FWD**

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

t_{rr} = f(R_{goff})



With an inductive load at

V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	10	A

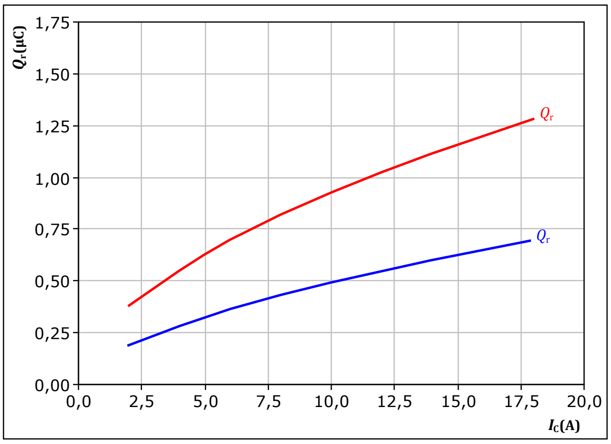
T_j: 25 °C, 125 °C

Inverter Switching Characteristics

figure 27. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



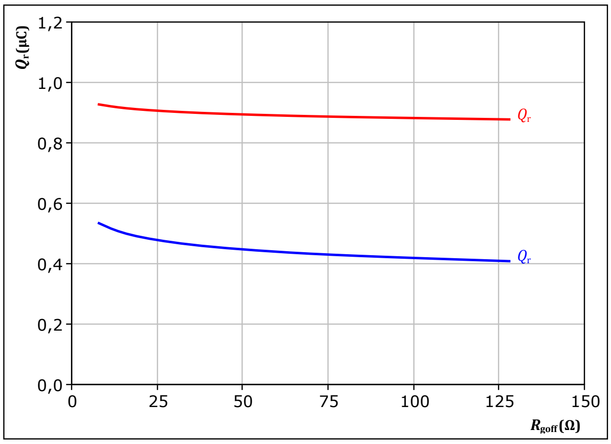
With an inductive load at

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

figure 28. **FWD**

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



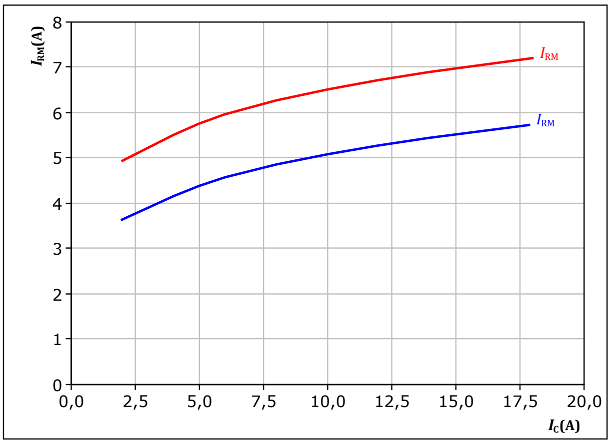
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	10	A		

figure 29. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



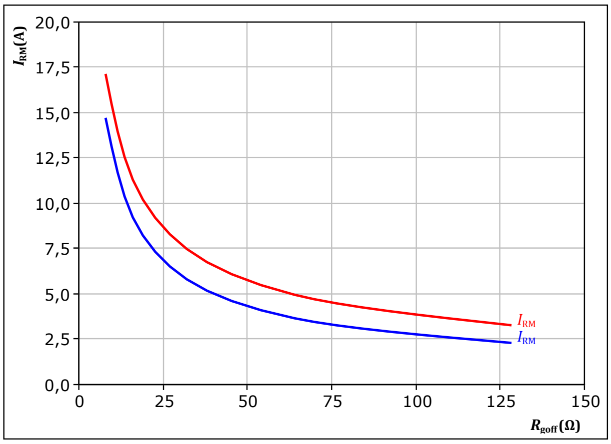
With an inductive load at

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

figure 30. **FWD**

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

I_{RM} = f(R_{goff})



With an inductive load at

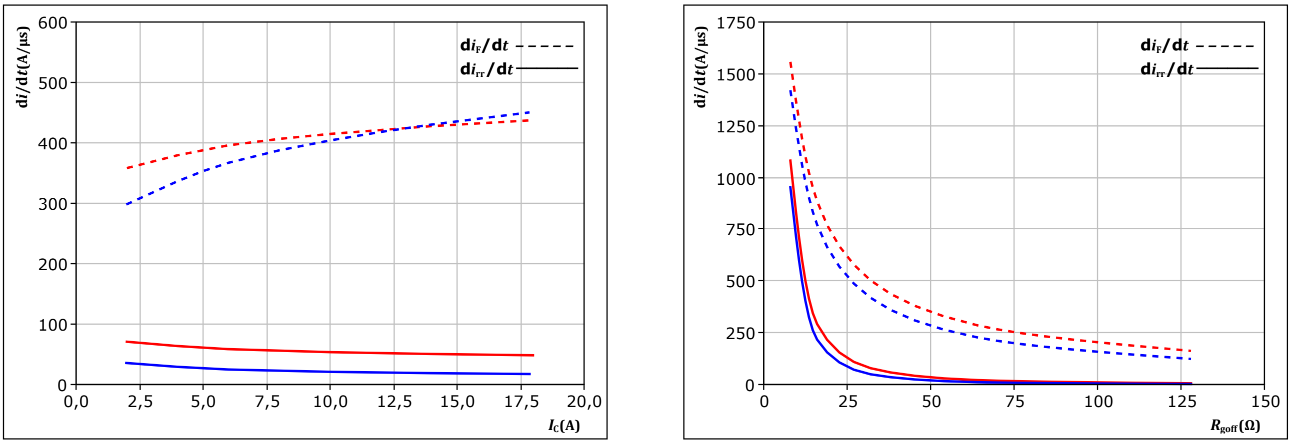
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	10	A		

Inverter Switching Characteristics

figure 31. **FWD**

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

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



With an inductive load at

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

T_j: 25 °C, 125 °C

figure 32. **FWD**

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

di_F/dt, di_{rr}/dt = f(R_{goff})

With an inductive load at

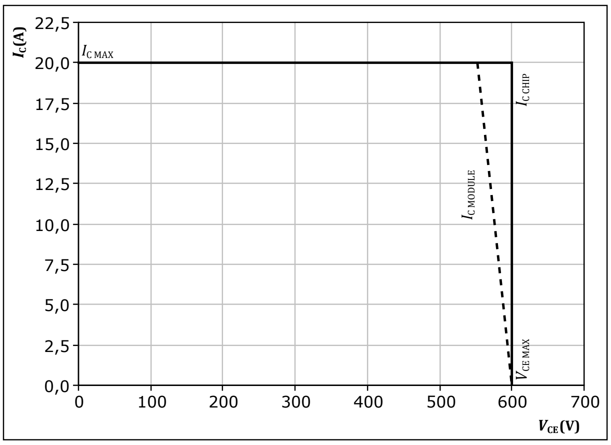
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	10	A

T_j: 25 °C, 125 °C

figure 33. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At

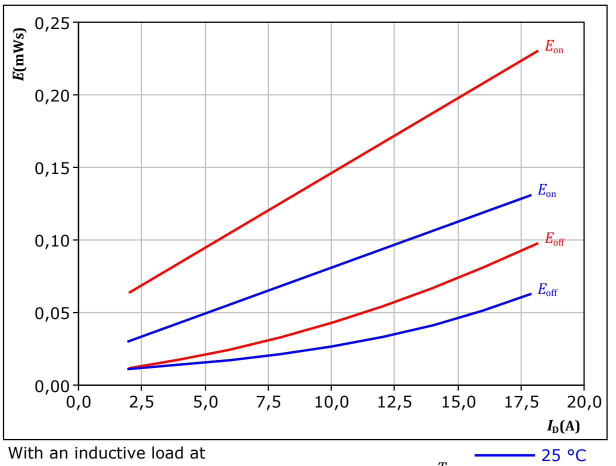
T_j =	125	°C
R_{gon} =	32	Ω
R_{goff} =	32	Ω

PFC Switching Characteristics

figure 34. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



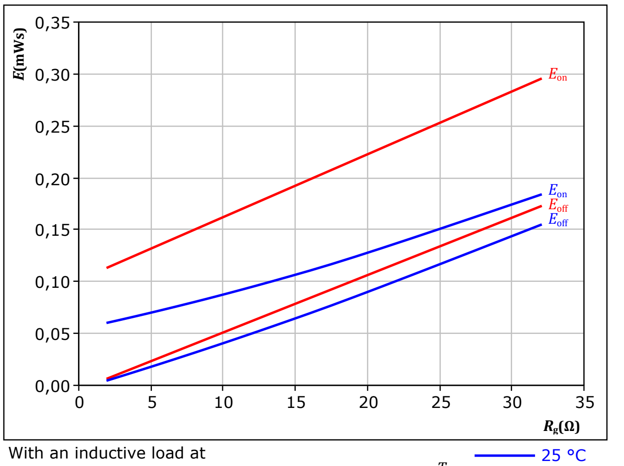
With an inductive load at

V_{DS} =	400	V	T_j:	25 °C
V_{GS} =	0/10	V		125 °C
R_{gon} =	8	Ω		
R_{goff} =	8	Ω		

figure 35. **MOSFET**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



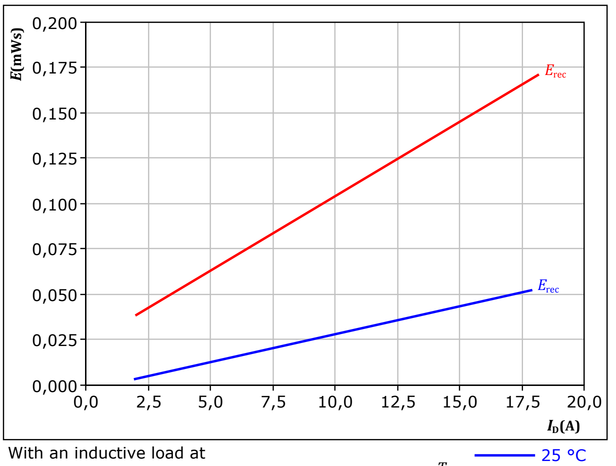
With an inductive load at

V_{DS} =	400	V	T_j:	25 °C
V_{GS} =	0/10	V		125 °C
I_D =	10	A		

figure 36. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



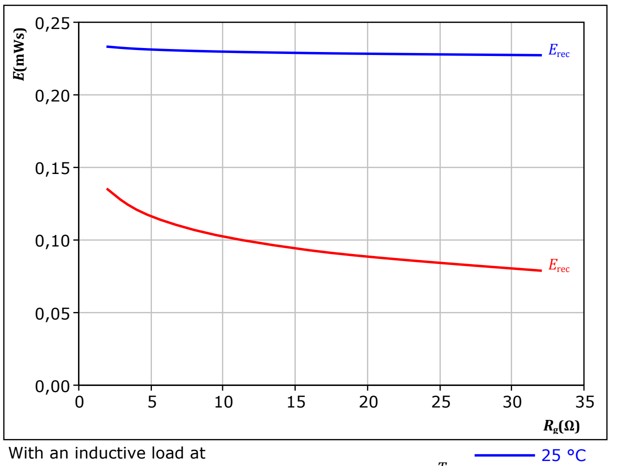
With an inductive load at

V_{DS} =	400	V	T_j:	25 °C
V_{GS} =	0/10	V		125 °C
R_{gon} =	8	Ω		

figure 37. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

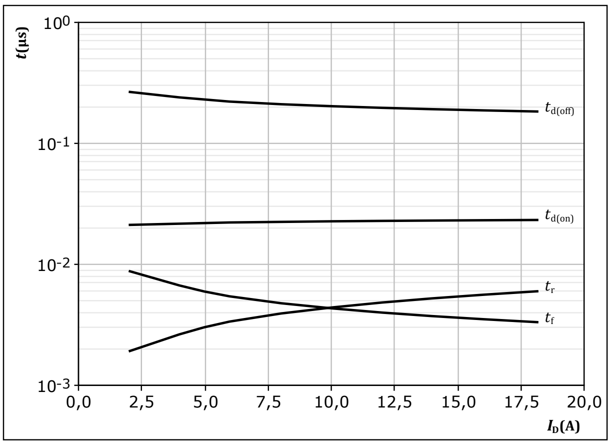
V_{DS} =	400	V	T_j:	25 °C
V_{GS} =	0/10	V		125 °C
I_D =	10	A		

PFC Switching Characteristics

figure 38. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



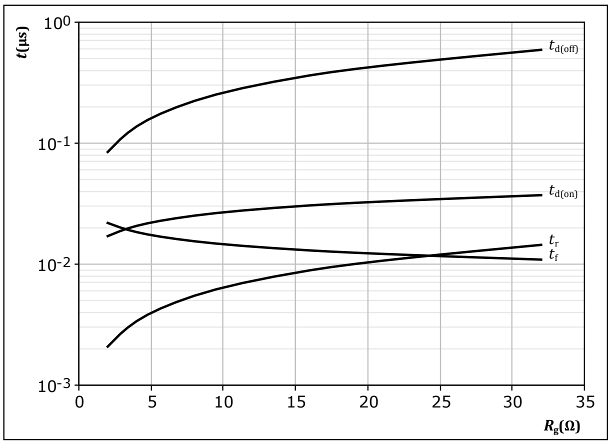
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 39. **MOSFET**

Typical switching times as a function of gate resistor

$t = f(R_g)$



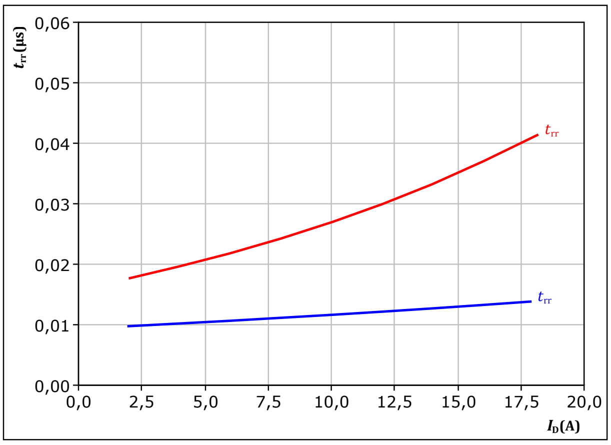
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	10	A

figure 40. **FWD**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



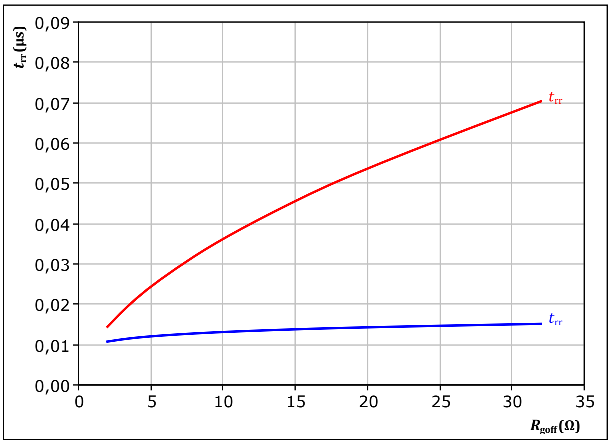
At			
	V_{DS} =	400	V
	V_{GS} =	0/10	V
	R_{gon} =	8	Ω

T_j: 25 °C, 125 °C

figure 41. **FWD**

Typical reverse recovery time as a function of turn off gate resistor

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



At			
	V_{DS} =	400	V
	V_{GS} =	0/10	V
	I_D =	10	A

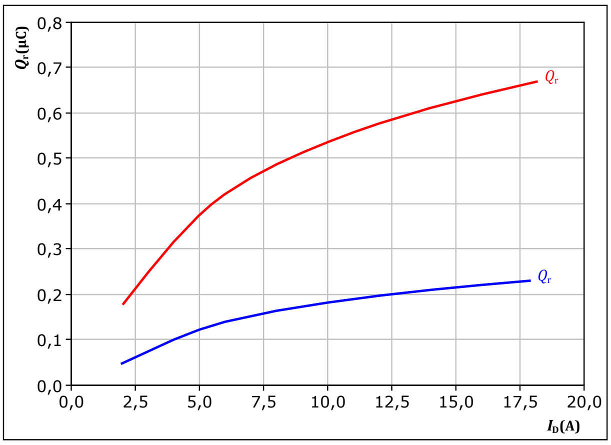
T_j: 25 °C, 125 °C

PFC Switching Characteristics

figure 42. **FWD**

Typical recovered charge as a function of drain current

Q_r = f(I_D)

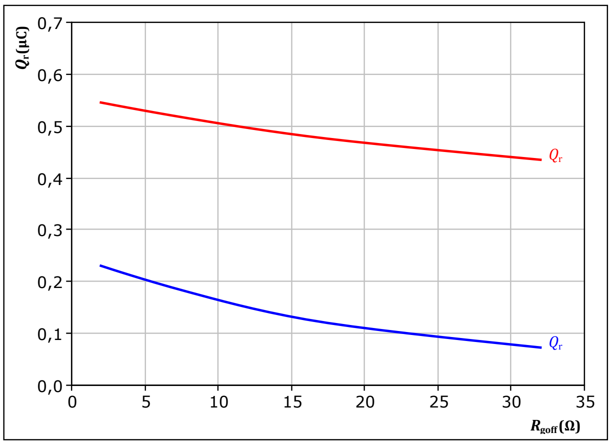


At V_{DS} = 400 V; V_{GS} = 0/10 V; R_{gon} = 8 Ω; T_j: 25 °C, 125 °C

figure 43. **FWD**

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})

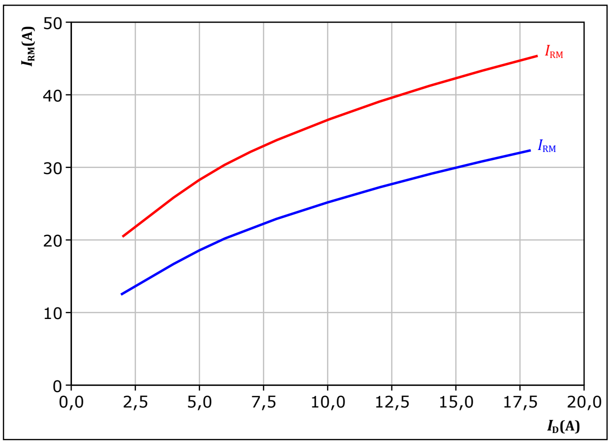


At V_{DS} = 400 V; V_{GS} = 0/10 V; I_D = 10 A; T_j: 25 °C, 125 °C

figure 44. **FWD**

Typical peak reverse recovery current as a function of drain current

I_{RM} = f(I_D)

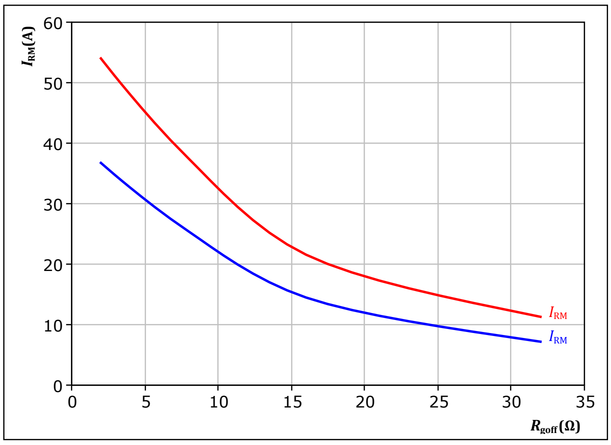


At V_{DS} = 400 V; V_{GS} = 0/10 V; R_{gon} = 8 Ω; T_j: 25 °C, 125 °C

figure 45. **FWD**

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

I_{RM} = f(R_{goff})



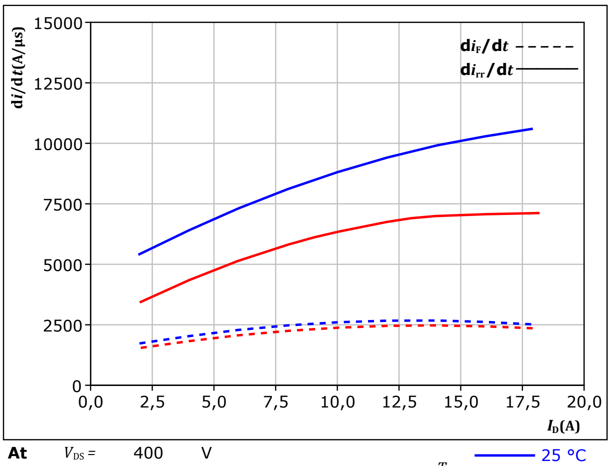
At V_{DS} = 400 V; V_{GS} = 0/10 V; I_D = 10 A; T_j: 25 °C, 125 °C

PFC Switching Characteristics

figure 46. **FWD**

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

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

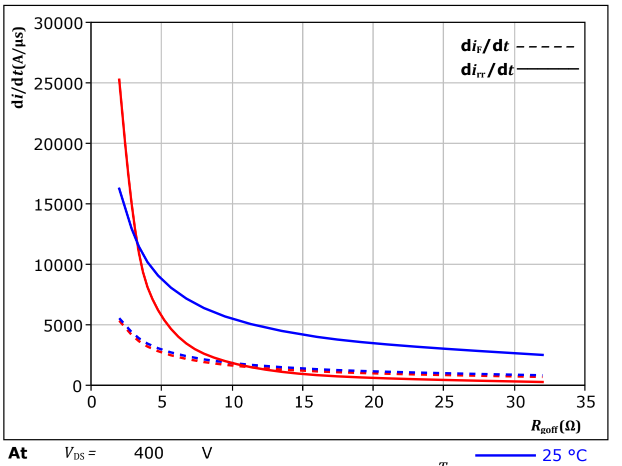


At	V_{DS} =	400	V	T_j:	25 °C
	V_{GS} =	0/10	V		125 °C
	R_{gon} =	8	Ω		

figure 47. **FWD**

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

di_F/dt, di_{rr}/dt = f(R_{goff})

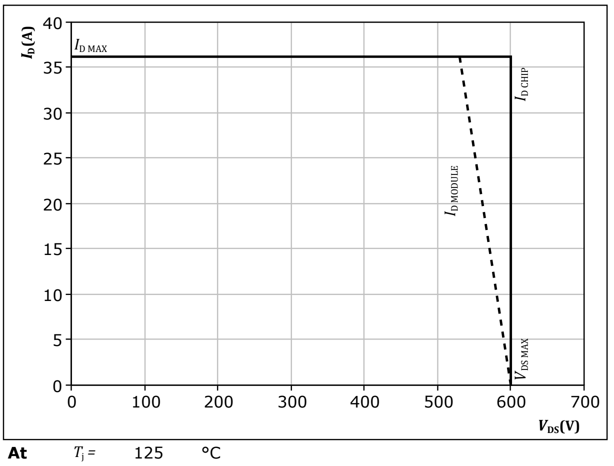


At	V_{DS} =	400	V	T_j:	25 °C
	V_{GS} =	0/10	V		125 °C
	I_D =	10	A		

figure 48. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At	T_j =	125	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

Inverter Switching Definitions

figure 49. **IGBT**

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

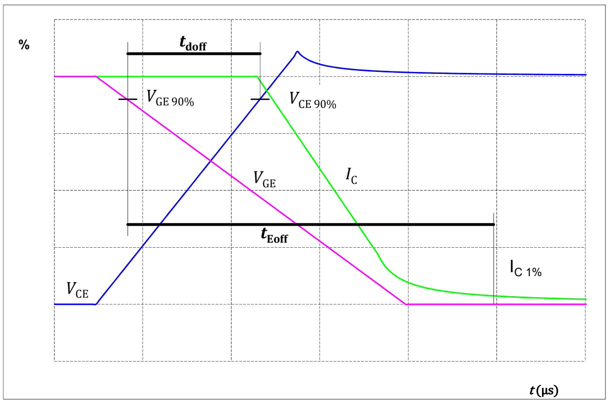


figure 50. **IGBT**

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

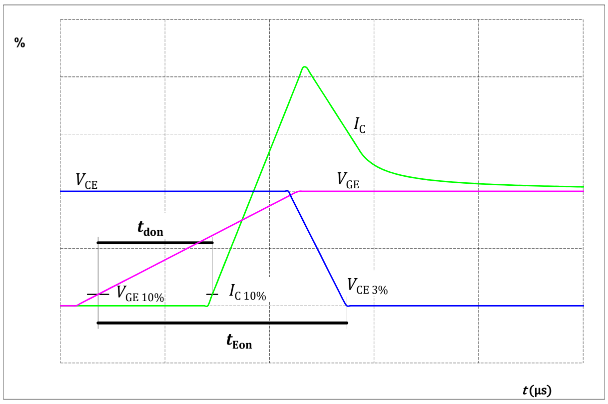


figure 51. **IGBT**

Turn-off Switching Waveforms & definition of t_f

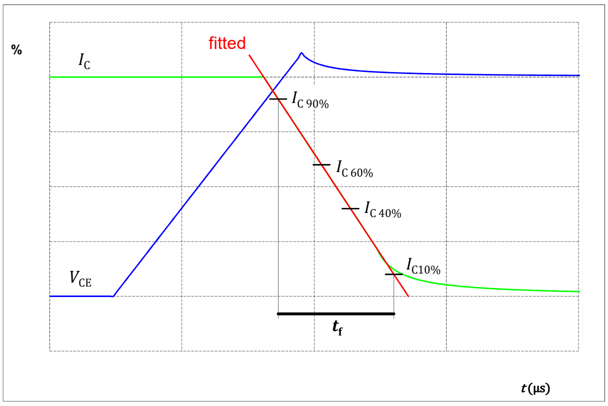
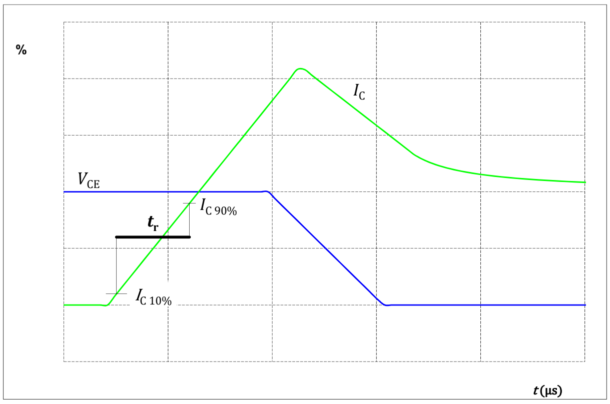


figure 52. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 53. **FWD**

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

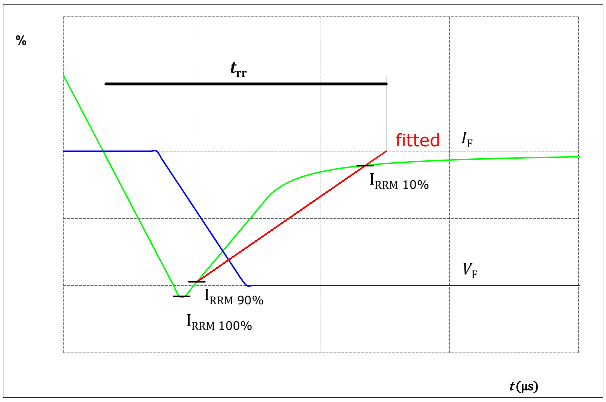
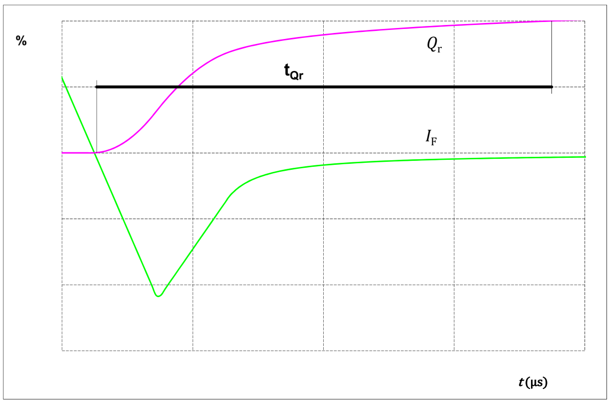


figure 54. **FWD**

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



PFC Switching Definitions

figure 49. **MOSFET**

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

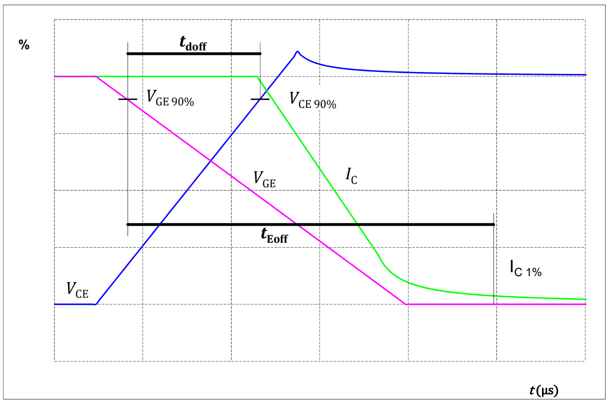


figure 50. **MOSFET**

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

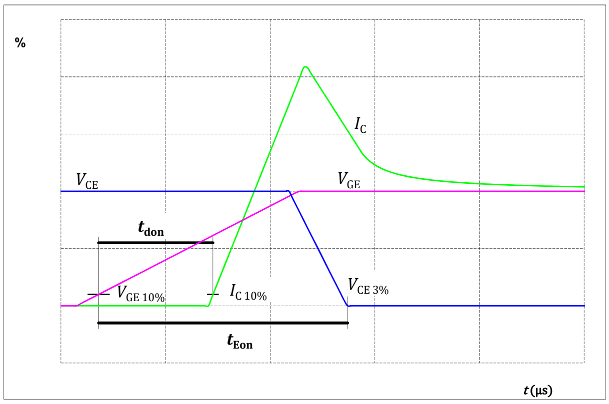


figure 51. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

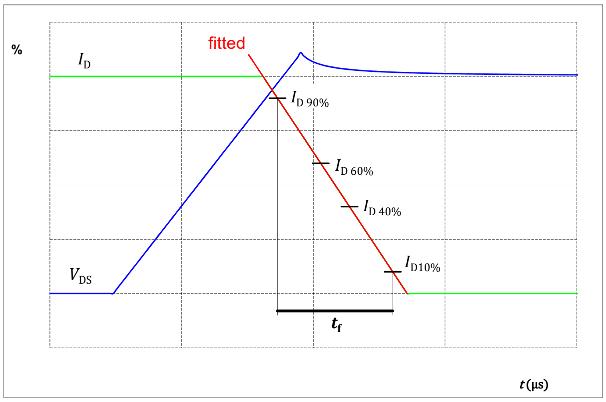
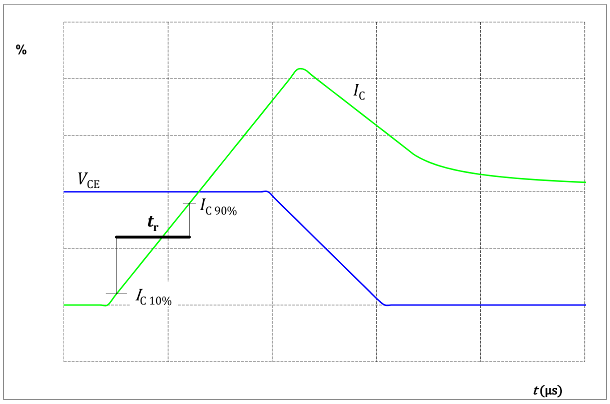


figure 52. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



PFC Switching Definitions

figure 53. **FWD**

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

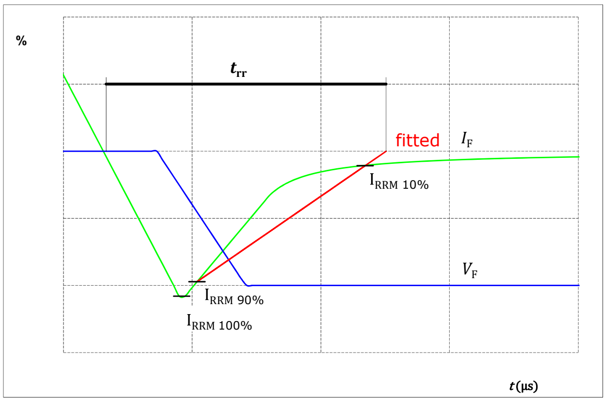


figure 54. **FWD**

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

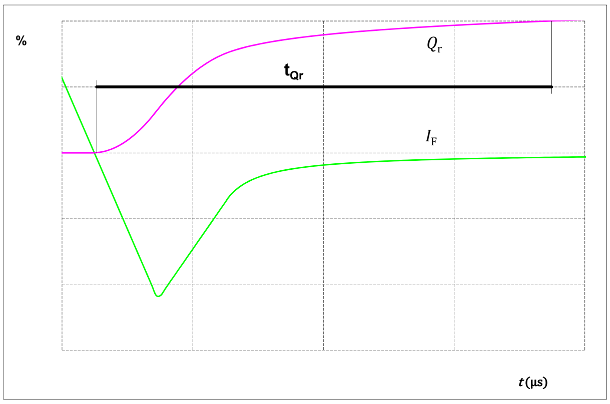
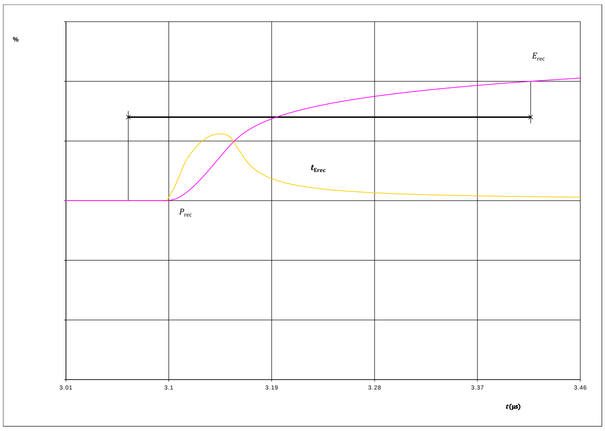


figure 55. **FWD**

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



Ordering Code

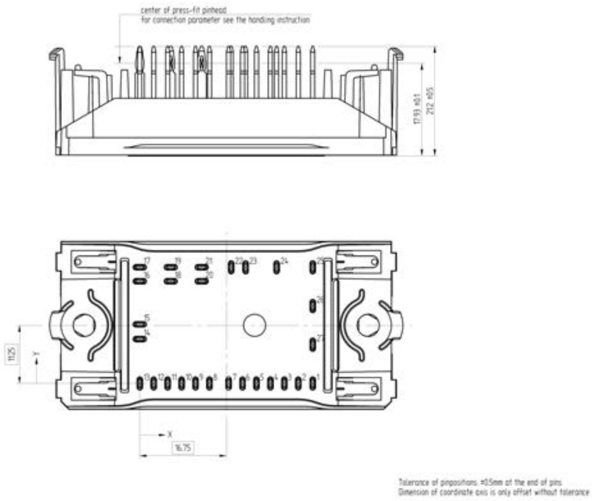
Version	Ordering Code
Without thermal paste	10-P006PPA010SB-M683BY
With thermal paste (5,2 W/mK, PTM6000HV)	10-P006PPA010SB-M683BY-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-P006PPA010SB-M683BY-/3/

Marking

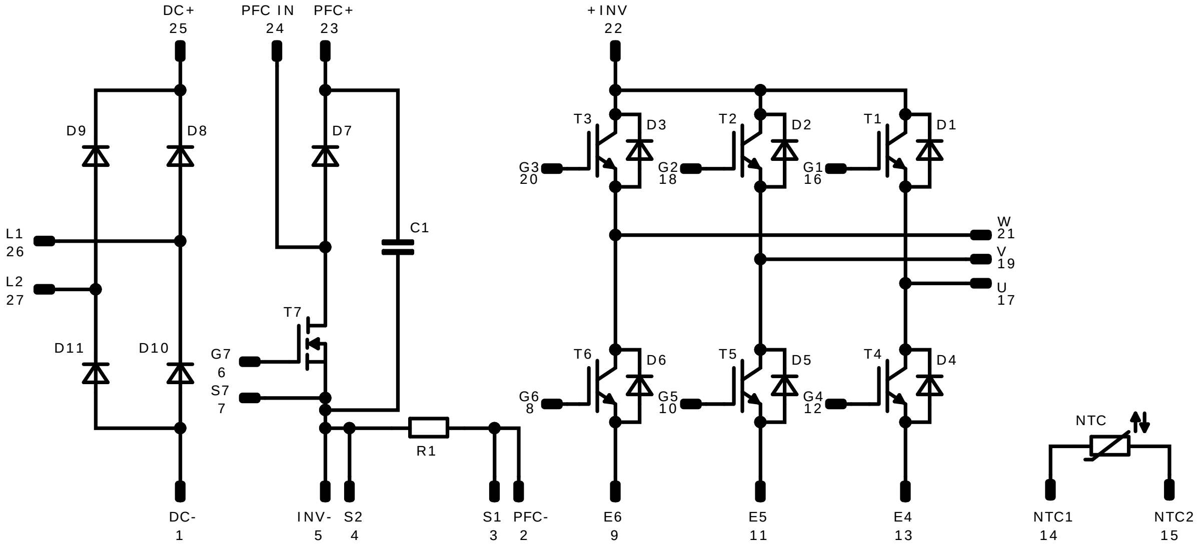
Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
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



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T6, T3, T5, T2, T4, T1	IGBT	600 V	10 A	Inverter Switch	
D3, D6, D2, D5, D1, D4	FWD	600 V	10 A	Inverter Diode	
T7	MOSFET	600 V	90 mΩ	PFC Switch	
D7	FWD	600 V	15 A	PFC Diode	
D11, D9, D10, D8	Rectifier	1600 V	25 A	Rectifier Diode	
R1	Shunt			PFC Shunt	
C1	Capacitor	500 V		Capacitor (PFC)	
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.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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-P006PPA010SB-M683BY-D5-14	30 Sep. 2021	New Datasheet format, module is unchanged Update dynamic characteristic of PFC Separate datasheet for pressfit pin and 4T12 version	