Vincotech

10-P006PPA020SB03-M685B09Y
datasheet

***flow*PIM 0 + PFC** **600 V / 20 A**

Topology features

- Converter+PFC+Inverter
- Integrated Shunt Resistor
- Open Emitter configuration
- Temperature sensor

Component features

- Easy paralleling
- Low turn-off losses
- Positive temperature coefficient
- Short tail current

Housing features

- Base isolation: Al_2O_3
- Clip-in, reliable mechanical connection, qualified for wave soldering
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

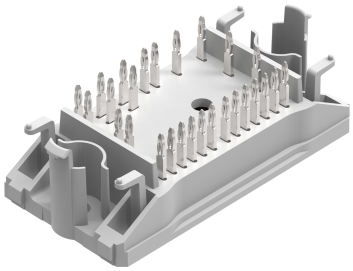
Target applications

- Embedded Drives
- Industrial Drives

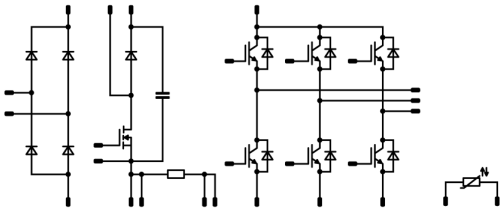
Types

- 10-P006PPA020SB03-M685B09Y

flow 0 17 mm housing



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	26	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	56	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	32	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	52	W
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
PFC Switch					
Drain-source voltage	V_{DSS}			600	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$	T_s = 80 °C	23	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		151	A
Avalanche energy, single pulse	E_{AS}	V_{DD} = 50 V	I_D = 0 A	159	mJ
Avalanche energy, repetitive	E_{AR}	V_{DD} = 50 V	I_D = 0 A	0,8	mJ
MOSFET dv/dt ruggedness	dv/dt	V_{DS}= 0..400 V	T_s = 25 °C	80	V/ns
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	67	W
Gate-source voltage	V_{GSS}			±20	V
Reverse diode dv/dt	dv/dt			50	V/ns
Maximum Junction Temperature	T_{jmax}			150	°C
PFC Diode					
Peak repetitive reverse voltage	V_{RRM}			600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	43	A
Surge (non-repetitive) forward current	I_{FSM}		T_j = 25 °C	180	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	59	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	38	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	46	W
Maximum junction temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
PFC Shunt				
DC current	I	T_c = 70 °C	22	A
Power dissipation	P_{tot}	T_c = 70 °C	5	W
Operation Temperature	T_{op}		-55 ... 170	°C
Capacitor (PFC)				
Maximum DC voltage	V_{MAX}		500	V
Operation Temperature	T_{op}		-55 ... 125	°C
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			>12,7	mm
Clearance			>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}			0,00029	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		20	25 125	1,1	1,55 1,75	1,9(1)	V
Collector-emitter cut-off current	I_{CES}		0	600		25			1,1	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		1100		pF
Output capacitance	C_{oes}							71		pF
Reverse transfer capacitance	C_{res}							32		pF
Gate charge	Q_g	V_{CC} = 480 V	0/15		20	25		120		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,7		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	400	15	25 125		65,6 65,2		ns
Rise time	t_r					25 125		19,8 21		ns
Turn-off delay time	$t_{d(off)}$					25 125		141,8 167		ns
Fall time	t_f					25 125		76,33 86,36		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,883 µC Q_{rFWD}=1,79 µC				25 125		0,45 0,667		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,385 0,523		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	
Inverter Diode										
Static										
Forward voltage	V_F				30	25 125	1,25	1,65 1,61	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)						1,81		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=731 A/µs di/dt=708 A/µs	±15	400	15	25 125		10,06 13,55		A
Reverse recovery time	t_{rr}					25 125		173,99 233,08		ns
Recovered charge	Q_r					25 125		0,883 1,79		µC
Reverse recovered energy	E_{rec}					25 125		0,236 0,474		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		36,18 85,35		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		15,9	25 125		63,3 115	60(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,0008	25	3	3,5	4	V
Gate to Source Leakage Current	I_{GSS}		20	0		25			100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	600		25			1	µA
Internal gate resistance	r_g							2,8		Ω
Gate charge	Q_g		0/10	400	15,9	25		67		nC
Short-circuit input capacitance	C_{iss}	f = 250 kHz	0	400	0	25		2895		pF
Short-circuit output capacitance	C_{oss}							48		
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,05		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	0/10	400	20	25 125		20,66 19,66		ns
Rise time	t_r					25 125		5,52 6,02		ns
Turn-off delay time	$t_{d(off)}$					25 125		72,75 81,2		ns
Fall time	t_f					25 125		1,38 2,18		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,58 µC Q_{rFWD}=1,19 µC				25 125		0,087 0,229		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,052 0,063		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				30	25 125 150		1,76 1,39 1,31	2,65[1] 1,8[1]	V
Reverse leakage current	I_R	V_r = 600 V				25 150		0,02 50	30 300	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,61		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=3939 A/µs di/dt=3830 A/µs	0/10	400	20	25 125		50,16 64,72		A
Reverse recovery time	t_{rr}					25 125		21,86 29,63		ns
Recovered charge	Q_r					25 125		0,58 1,19		µC
Reverse recovered energy	E_{rec}					25 125		0,203 0,341		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		28158,38 2947,25		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	
Rectifier Diode										
Static										
Forward voltage	V_F				18	25 125 150		1,06 0,994 0,973	1,5(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 1000	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,54		K/W
PFC Shunt										
Static										
Resistance	R							10		mΩ
Tolerance							-1		1	%
Temperature coeficient	tc								30	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		%

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	
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					25		130		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	

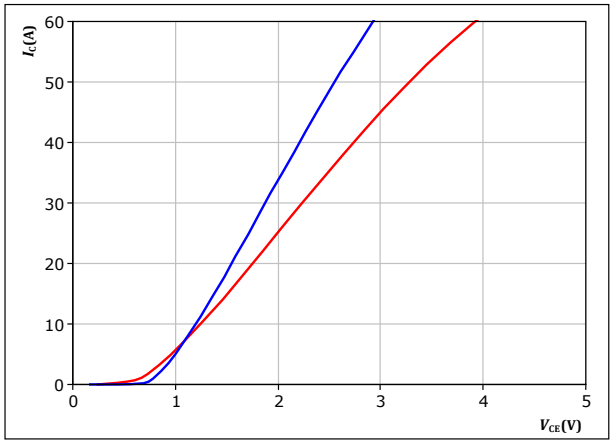
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

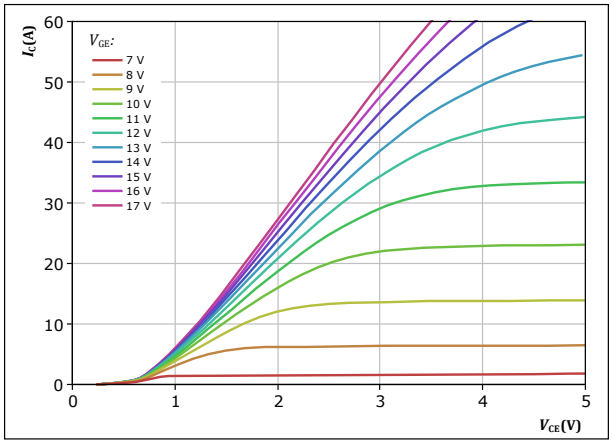


t_p =	250	µs	T_j:	25 °C
V_{GE} =	15	V		125 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



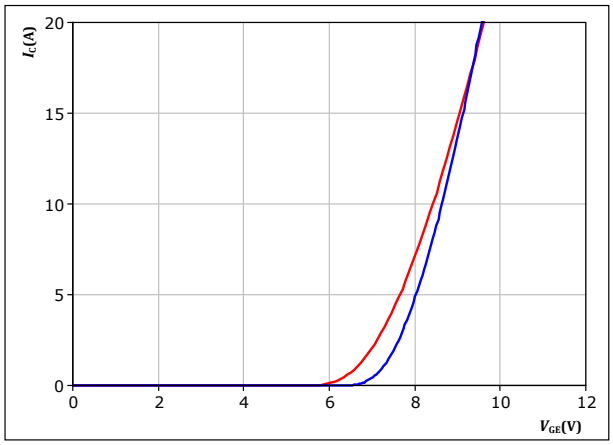
t_p =	250	µs
T_j =	125	°C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

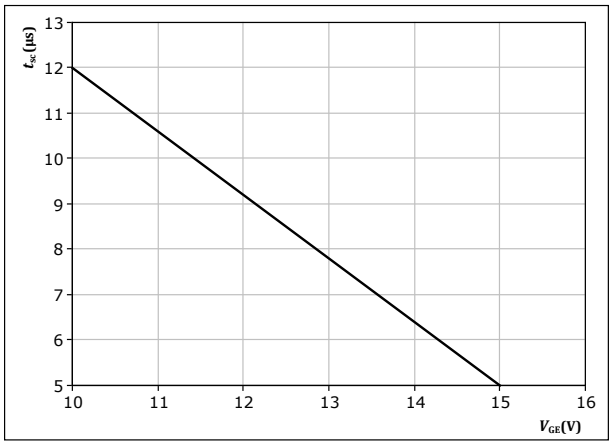


t_p =	250	µs	T_j:	25 °C
V_{CE} =	10	V		125 °C

figure 4. **IGBT**

Short circuit withstand time as a function of V_{GE}

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



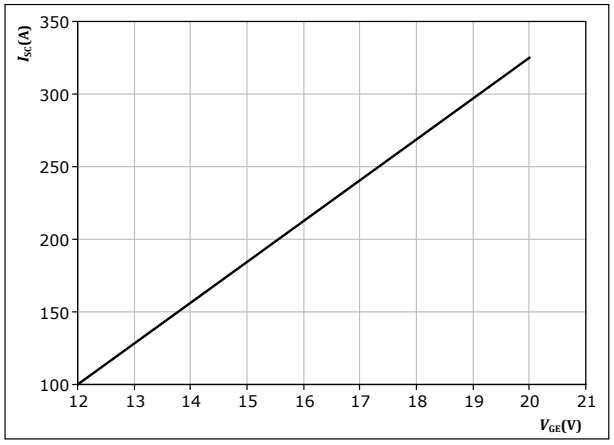
At	V_{CE} =	333	V
	$T_j \leq$	333	°C

Inverter Switch Characteristics

figure 5. **IGBT**

Typical short circuit current as a function of V_{GE}

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

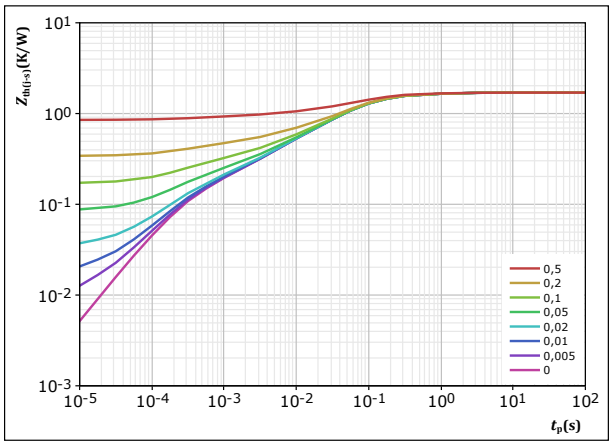


At	V_{CE} =	333	V
	$T_j \leq$	333	°C

figure 6. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,701	K/W

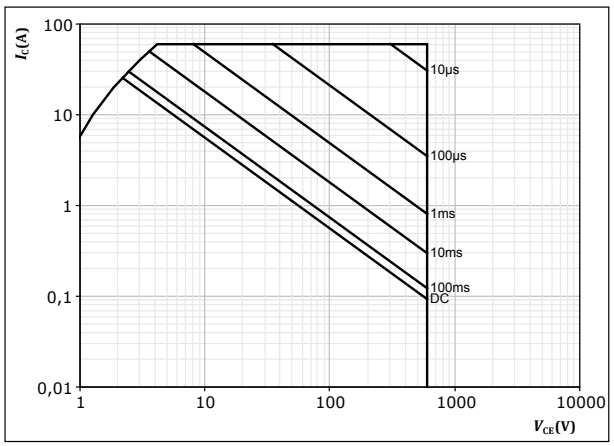
IGBT thermal model values

R (K/W)	τ (s)
9,97E-02	1,34E+00
3,46E-01	1,70E-01
8,15E-01	5,34E-02
2,54E-01	7,74E-03
7,70E-02	1,33E-03
1,09E-01	2,63E-04

figure 7. **IGBT**

Safe operating area

$I_C = f(V_{CE})$

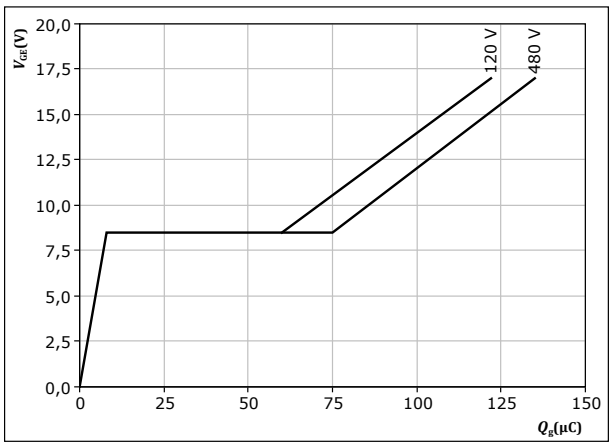


D =	single pulse		
T_s =	80	°C	
V_{GE} =	15	V	
T_j =	T_{jmax}		

figure 8. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_g)$



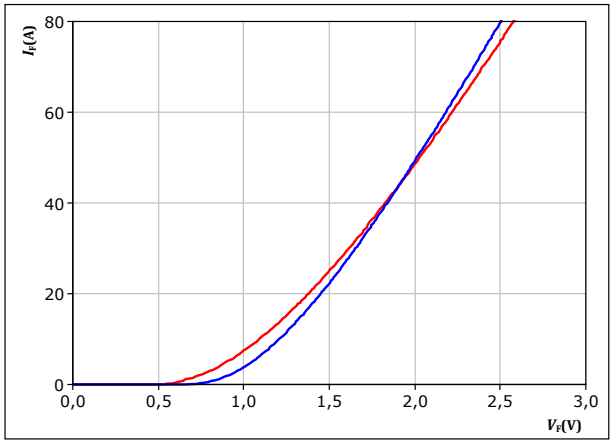
I_C =	33	A	
T_j =	25	°C	

Inverter Diode Characteristics

figure 9. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



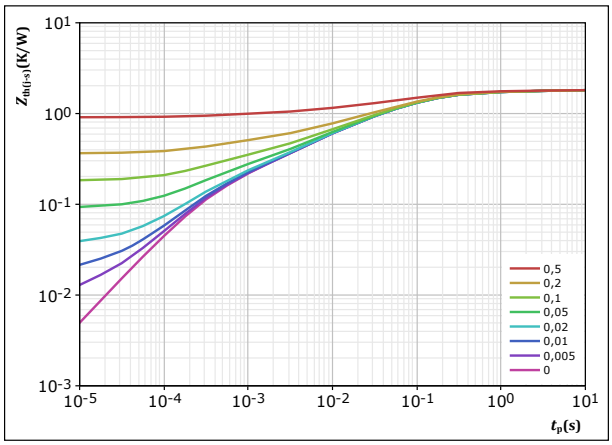
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 10. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,811 K/W

FWD thermal model values

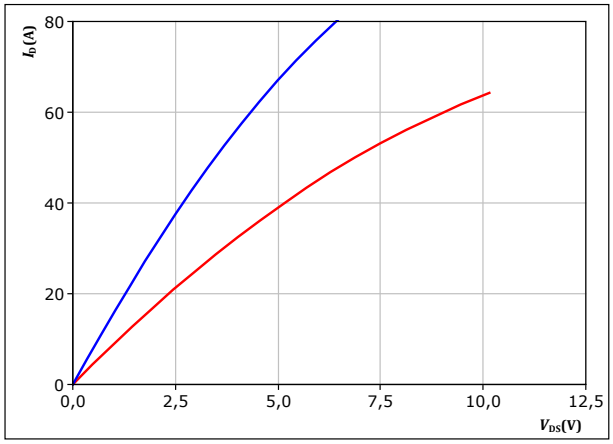
R (K/W)	τ (s)
8,35E-02	4,59E+00
2,01E-01	4,81E-01
7,60E-01	9,25E-02
4,22E-01	1,80E-02
2,13E-01	3,31E-03
1,40E-01	3,46E-04

PFC Switch Characteristics

figure 11. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

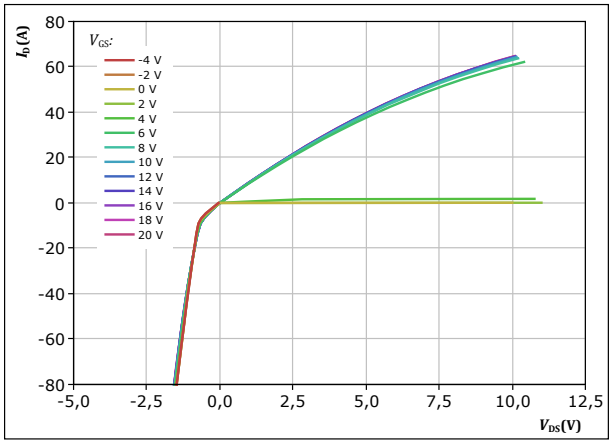


t_p =	250	µs	T_j:	25 °C
V_{GS} =	10	V		125 °C

figure 12. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



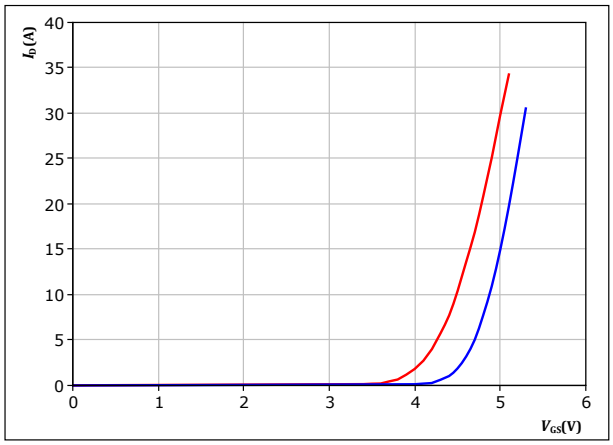
t_p =	250	µs
T_j =	125	°C

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

figure 13. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

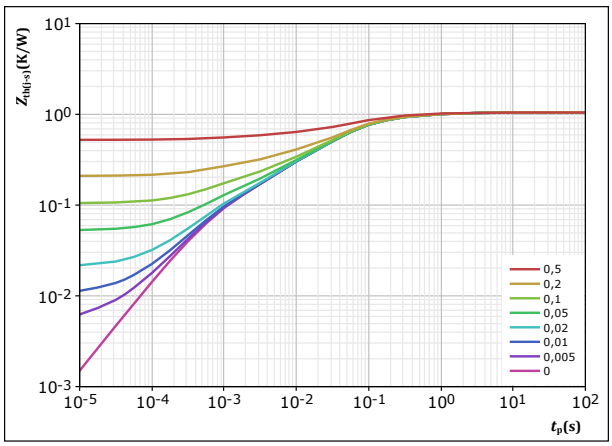


t_p =	250	µs	T_j:	25 °C
V_{DS} =	10	V		125 °C

figure 14. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,047	K/W

MOSFET thermal model values

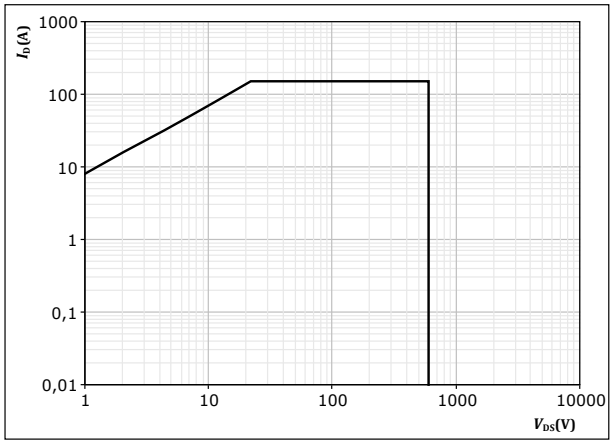
R (K/W)	τ (s)
6,31E-02	1,89E+00
2,11E-01	2,50E-01
5,41E-01	5,16E-02
1,55E-01	6,52E-03
7,68E-02	6,66E-04

PFC Switch Characteristics

figure 15. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



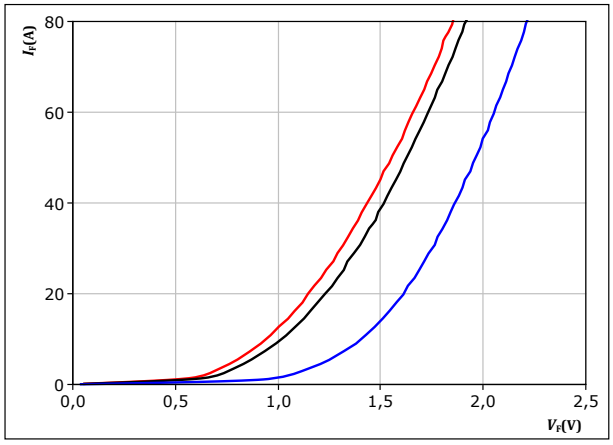
$D =$ single pulse
$T_s =$ 80 °C
$V_{GS} =$ 10 V
$T_j =$ T_{jmax}

PFC Diode Characteristics

figure 16. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



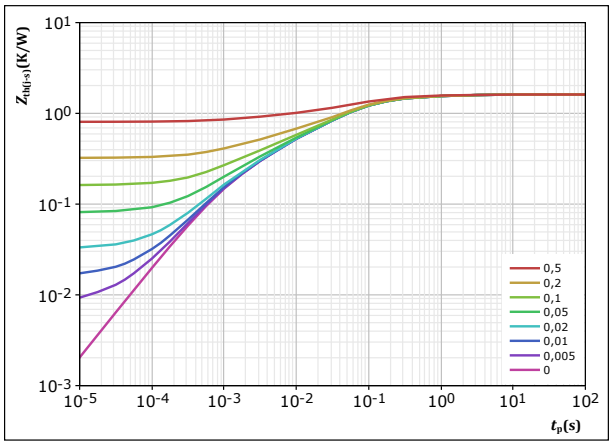
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 17. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,613 K/W

FWD thermal model values

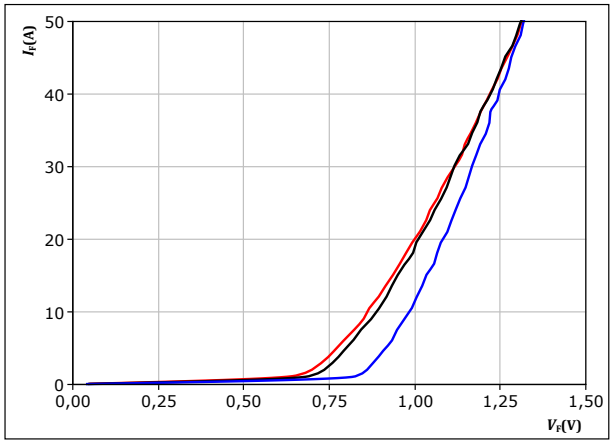
R (K/W)	τ (s)
9,69E-02	2,09E+00
2,90E-01	2,16E-01
7,68E-01	5,39E-02
3,12E-01	7,17E-03
1,46E-01	1,00E-03

Rectifier Diode Characteristics

figure 18. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



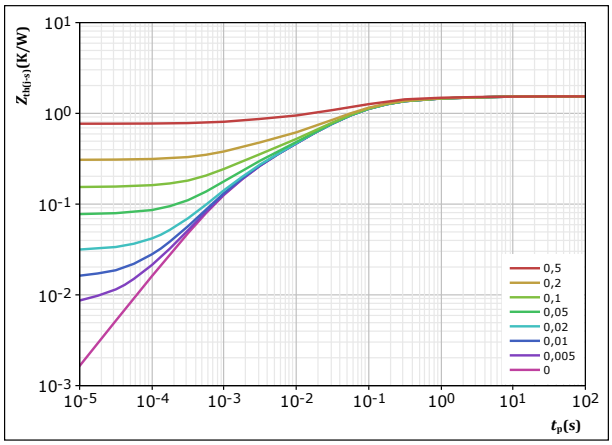
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 19. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,537 K/W

Rectifier thermal model values

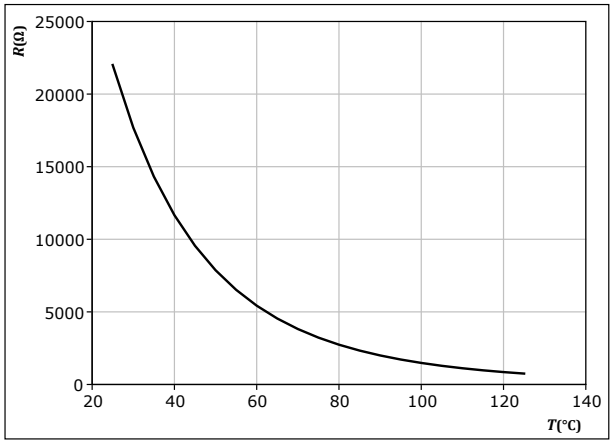
R (K/W)	τ (s)
7,03E-02	4,42E+00
2,01E-01	4,56E-01
7,63E-01	7,09E-02
3,40E-01	1,14E-02
1,63E-01	1,31E-03

Thermistor Characteristics

figure 20. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

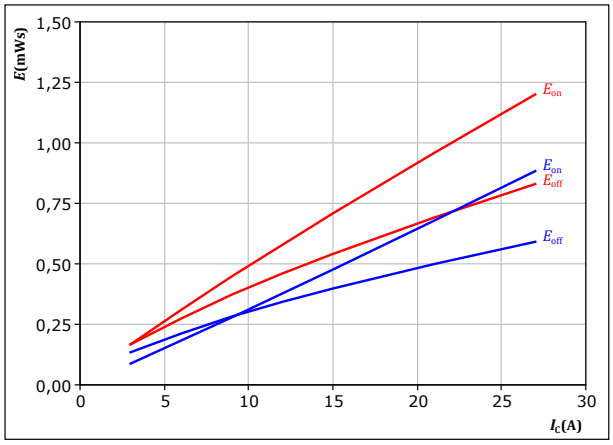


Inverter Switching Characteristics

figure 21. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

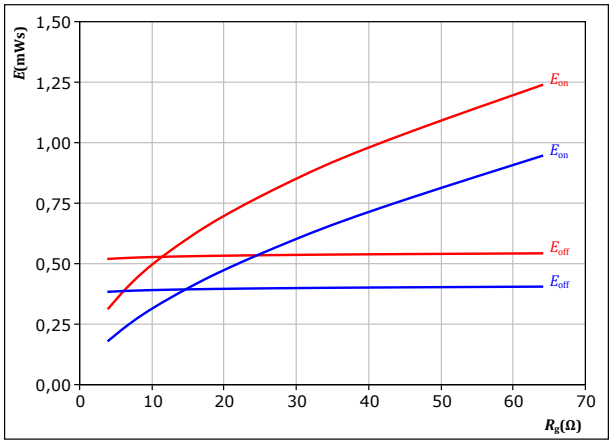
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

T_j: 25 °C, 125 °C

figure 22. **IGBT**

Typical switching energy losses as a function of IGBT turn on gate resistor

$E = f(R_g)$



With an inductive load at

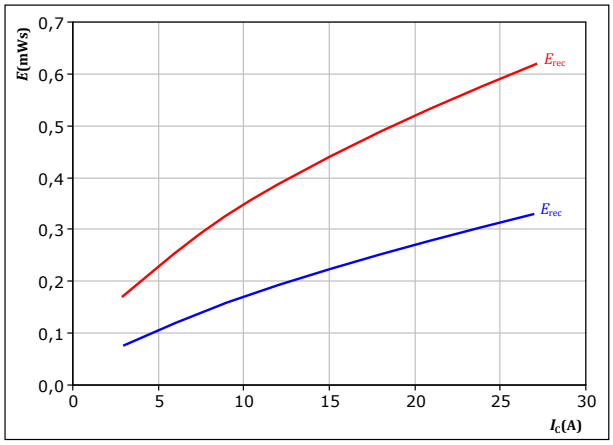
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	15	A

T_j: 25 °C, 125 °C

figure 23. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

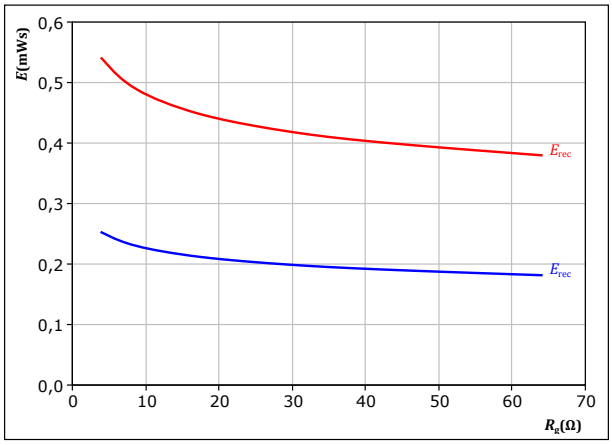
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

T_j: 25 °C, 125 °C

figure 24. **FWD**

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

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

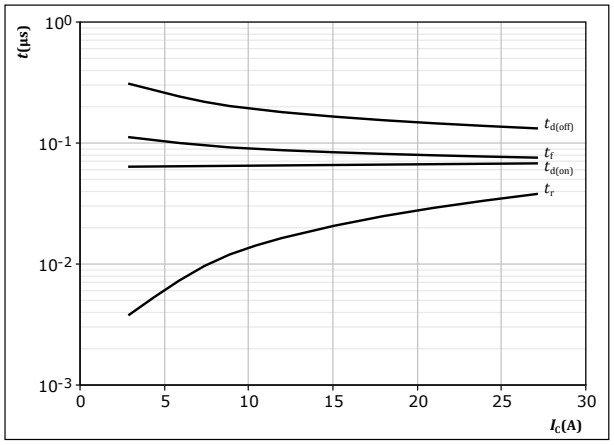
T_j: 25 °C, 125 °C

Inverter Switching Characteristics

figure 25. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



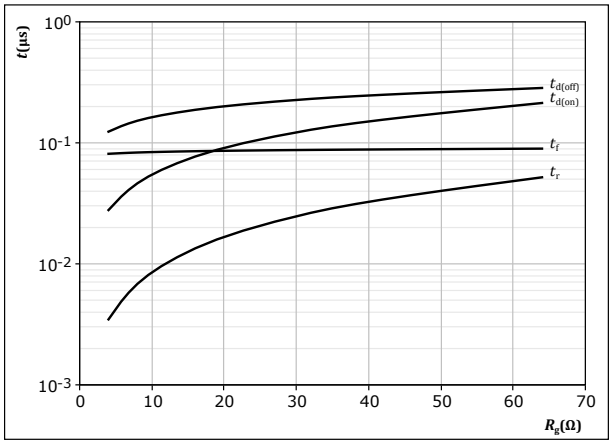
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 26. **IGBT**

Typical switching times as a function of IGBT turn on gate resistor

$t = f(R_g)$



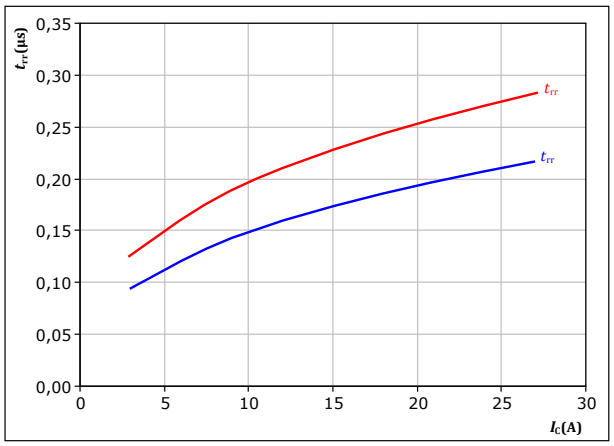
With an inductive load at

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

figure 27. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

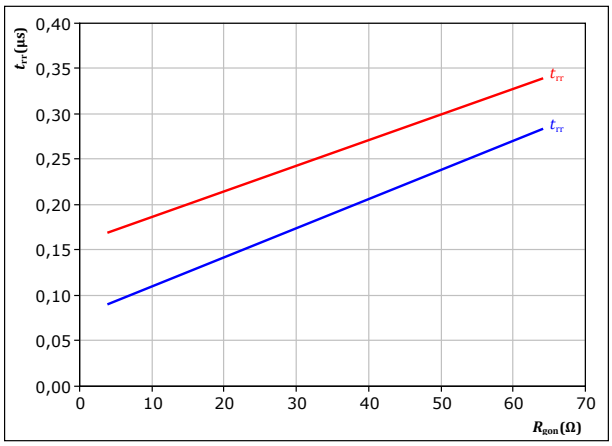
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

T_j: 25 °C, 125 °C

figure 28. **FWD**

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

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



With an inductive load at

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

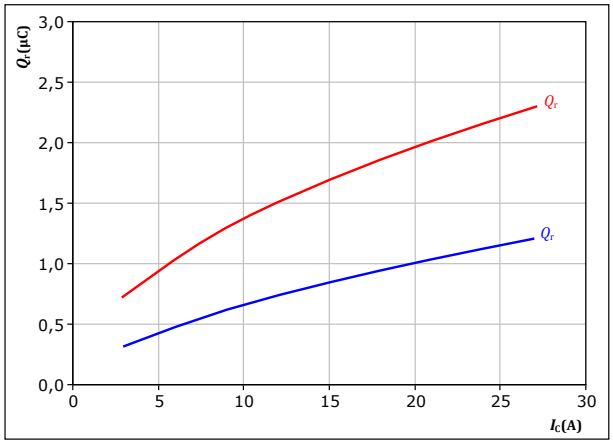
T_j: 25 °C, 125 °C

Inverter Switching Characteristics

figure 29. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



With an inductive load at

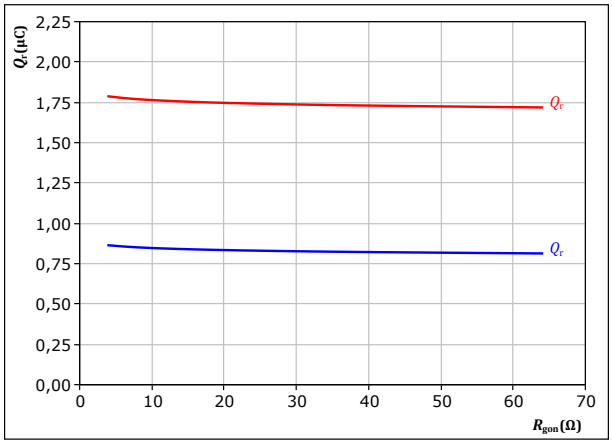
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

T_j: 25 °C, 125 °C

figure 30. **FWD**

Typical recovered charge as a function of IGBT turn on gate resistor

$Q_r = f(R_{gon})$



With an inductive load at

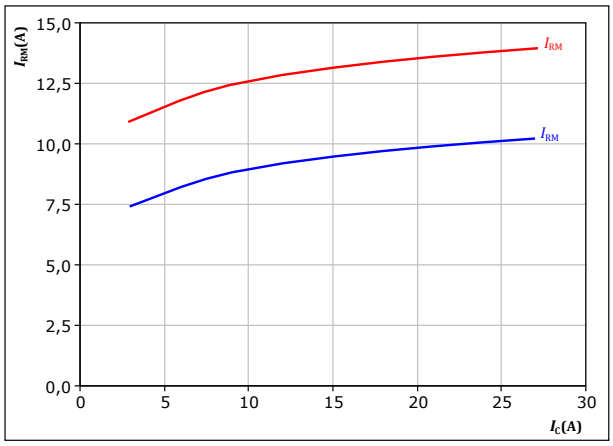
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	15	A

T_j: 25 °C, 125 °C

figure 31. **FWD**

Typical peak reverse recovery current as a function of collector current

$I_{RM} = f(I_C)$



With an inductive load at

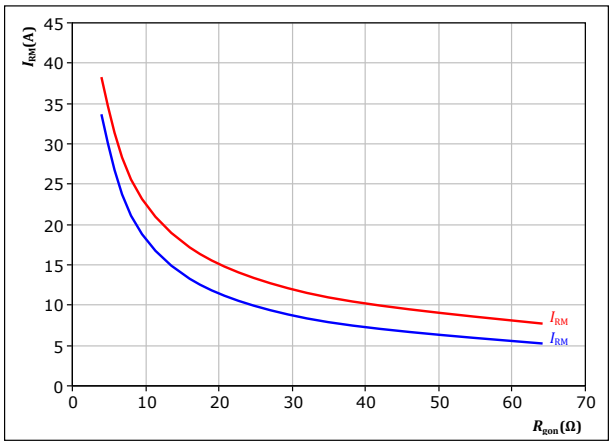
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

T_j: 25 °C, 125 °C

figure 32. **FWD**

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

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



With an inductive load at

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

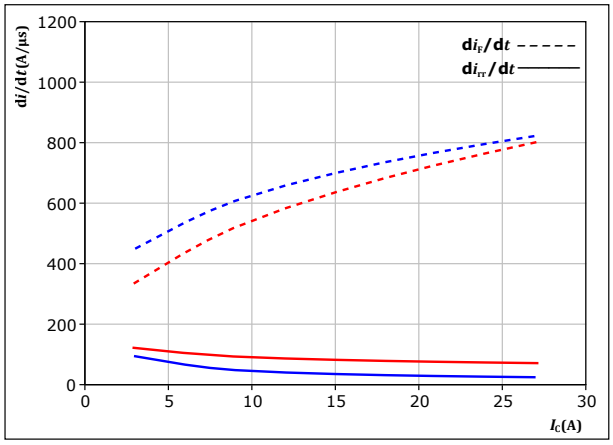
T_j: 25 °C, 125 °C

Inverter Switching Characteristics

figure 33. **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

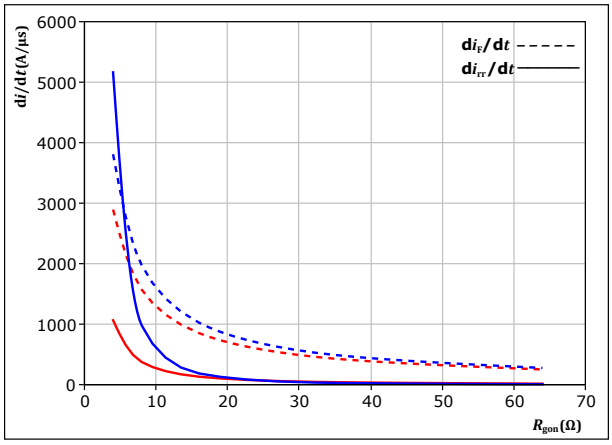
V_{CE} =	400	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

T_j: 25 °C, 125 °C

figure 34. **FWD**

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

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



With an inductive load at

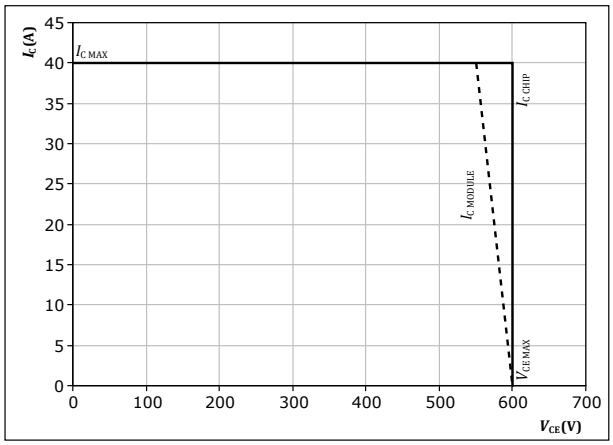
V_{CE} =	400	V
V_{GE} =	±15	V
I_C =	15	A

T_j: 25 °C, 125 °C

figure 35. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At

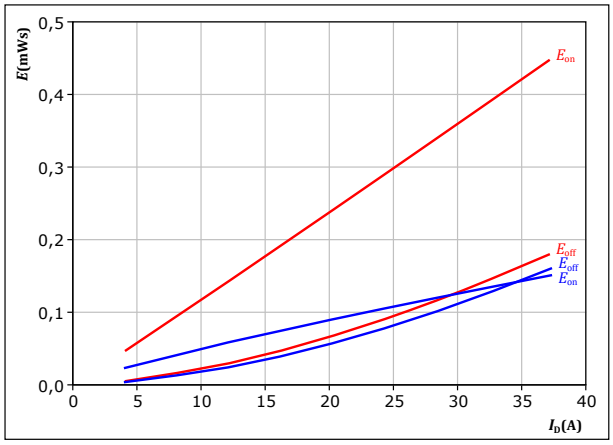
T_j =	125	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

PFC Switching Characteristics

figure 36. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

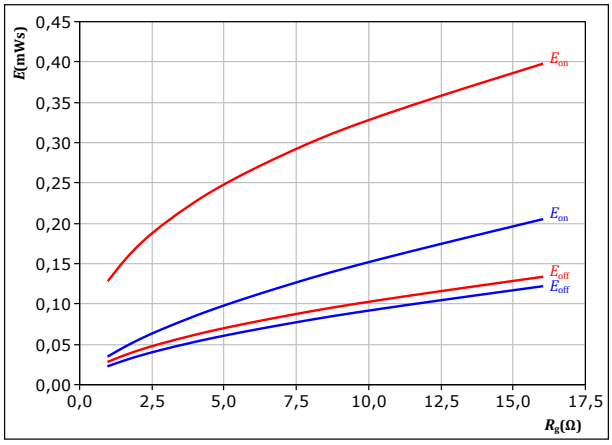
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

T_j: 25 °C, 125 °C

figure 37. **MOSFET**

Typical switching energy losses as a function of MOSFET turn on gate resistor

$E = f(R_g)$



With an inductive load at

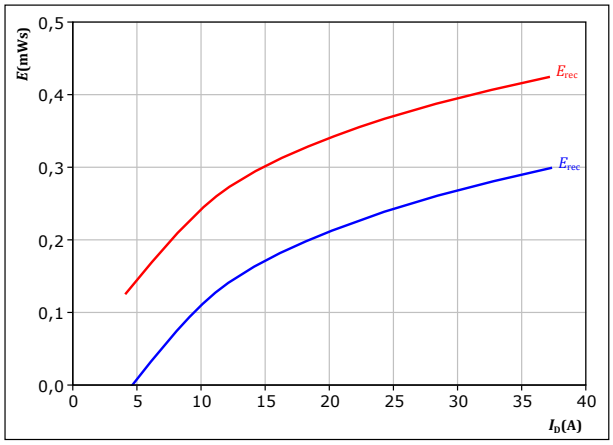
V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	20	A

T_j: 25 °C, 125 °C

figure 38. **FWD**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



With an inductive load at

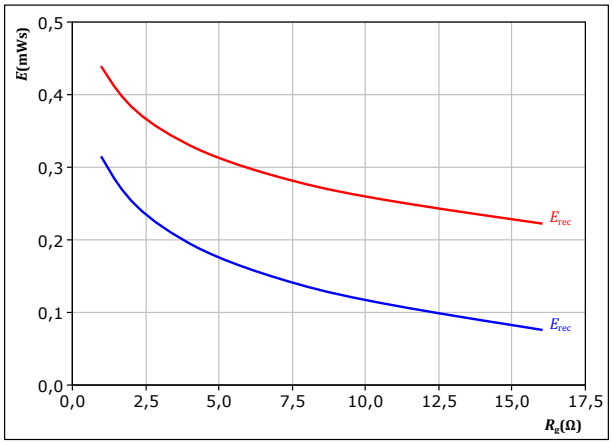
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C

figure 39. **FWD**

Typical reverse recovered energy loss as a function of MOSFET turn on gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	20	A

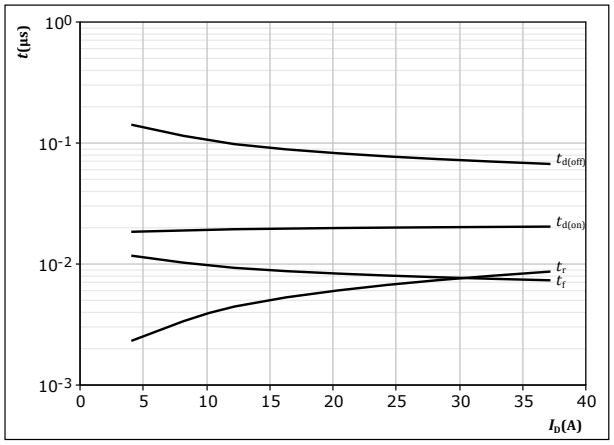
T_j: 25 °C, 125 °C

PFC Switching Characteristics

figure 40. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



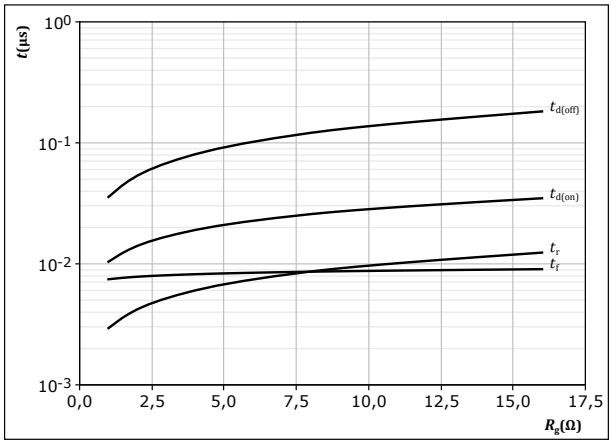
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 41. **MOSFET**

Typical switching times as a function of MOSFET turn on gate resistor

$t = f(R_g)$



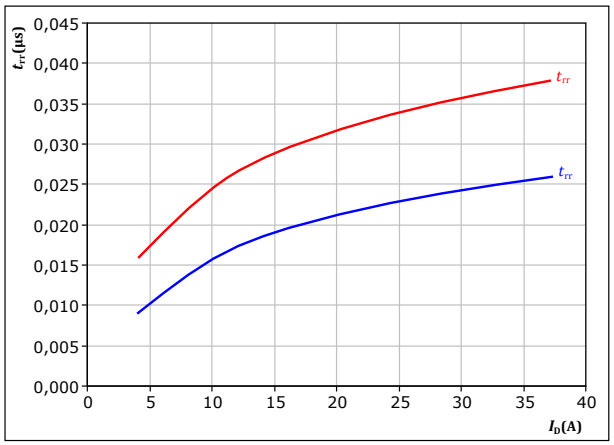
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	20	A

figure 42. **FWD**

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$



At

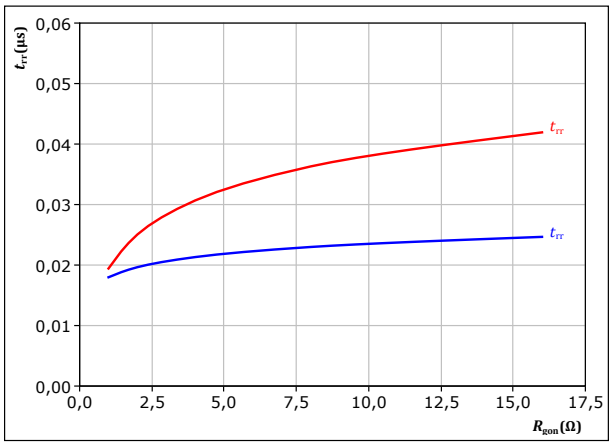
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C

figure 43. **FWD**

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

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



At

V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	20	A

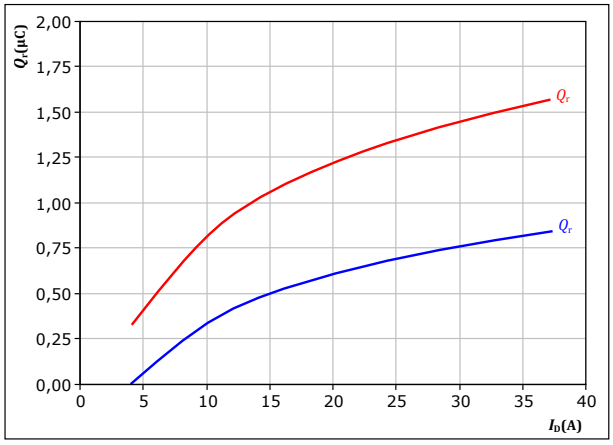
T_j: 25 °C, 125 °C

PFC Switching Characteristics

figure 44. **FWD**

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

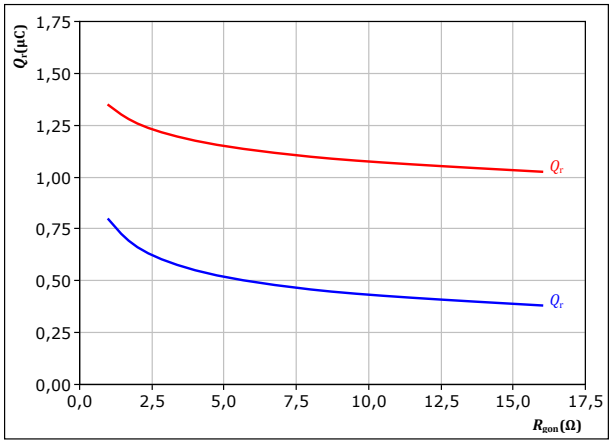


At				T_j:	
	V_{DS} =	400	V		25 °C
	V_{GS} =	0/10	V		125 °C
	R_{gon} =	4	Ω		

figure 45. **FWD**

Typical recovered charge as a function of MOSFET turn on gate resistor

$Q_r = f(R_{gon})$

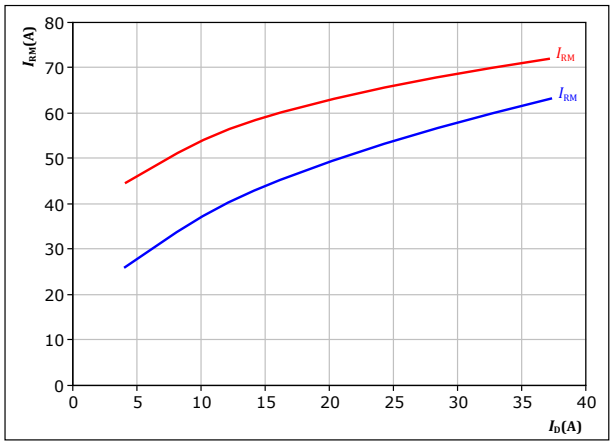


At				T_j:	
	V_{DS} =	400	V		25 °C
	V_{GS} =	0/10	V		125 °C
	I_D =	20	A		

figure 46. **FWD**

Typical peak reverse recovery current as a function of drain current

$I_{RM} = f(I_D)$

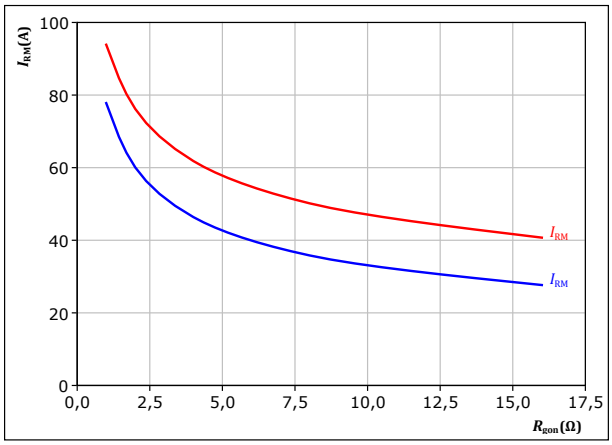


At				T_j:	
	V_{DS} =	400	V		25 °C
	V_{GS} =	0/10	V		125 °C
	R_{gon} =	4	Ω		

figure 47. **FWD**

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

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



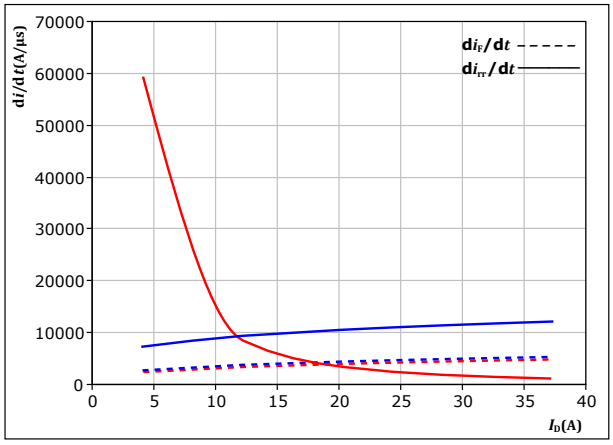
At				T_j:	
	V_{DS} =	400	V		25 °C
	V_{GS} =	0/10	V		125 °C
	I_D =	20	A		

PFC Switching Characteristics

figure 48. **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)



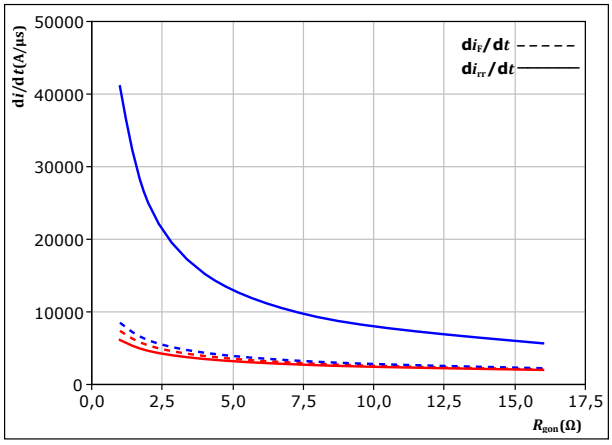
At			
	V_{DS} =	400	V
	V_{GS} =	0/10	V
	R_{gon} =	4	Ω

T_j: 25 °C, 125 °C

figure 49. **FWD**

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

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



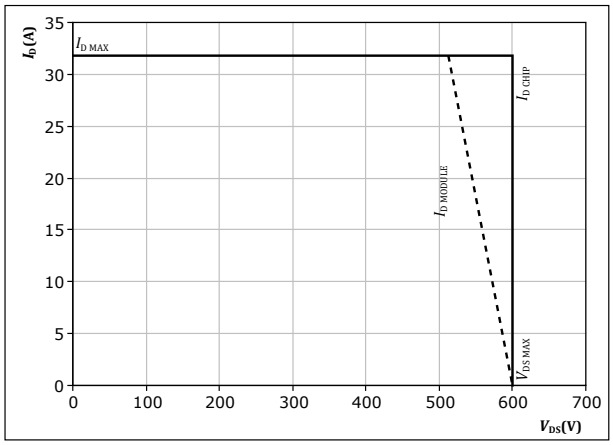
At			
	V_{DS} =	400	V
	V_{GS} =	0/10	V
	I_D =	20	A

T_j: 25 °C, 125 °C

figure 50. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



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

Inverter Switching Definitions

figure 51. **IGBT**

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

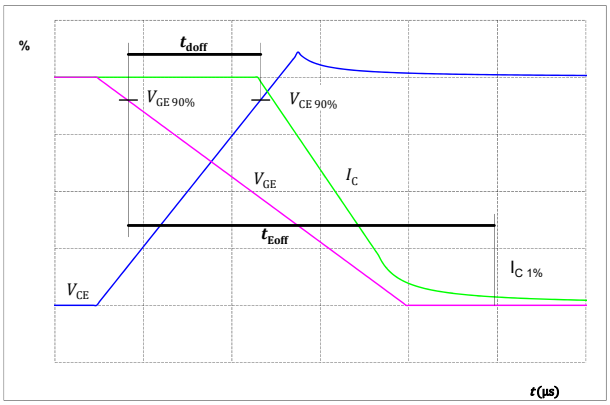


figure 52. **IGBT**

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

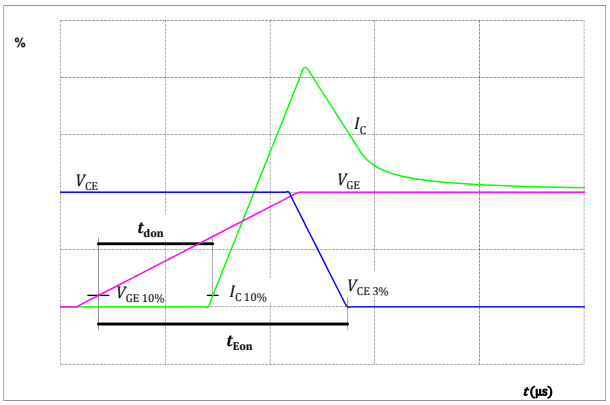


figure 53. **IGBT**

Turn-off Switching Waveforms & definition of t_f

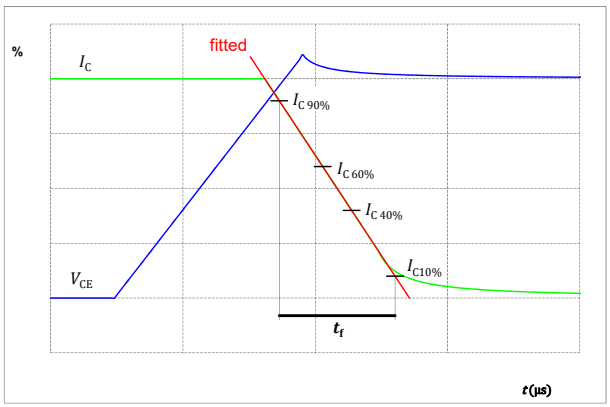
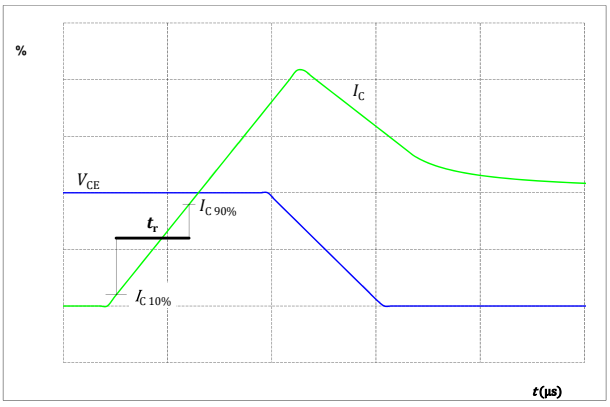


figure 54. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 55. **FWD**

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

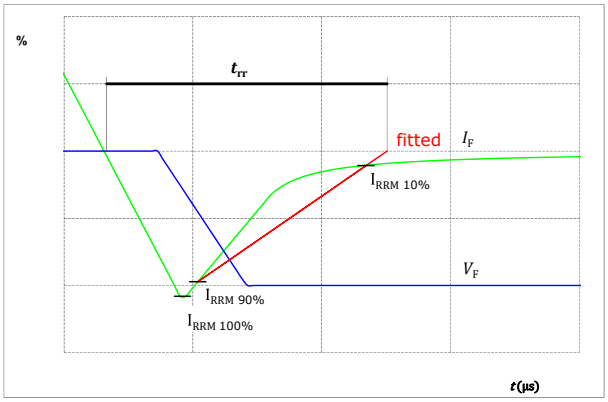
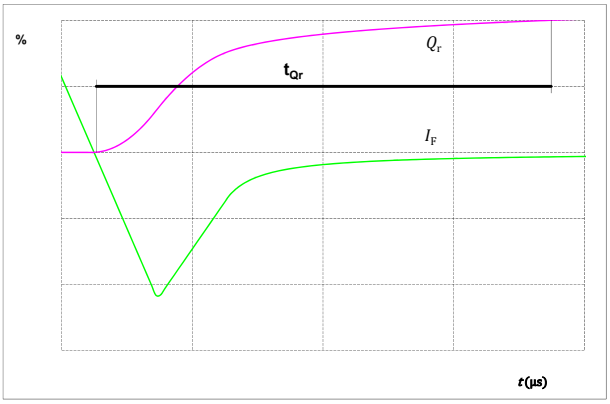


figure 56. **FWD**

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



PFC Switching Definitions

figure 51. **MOSFET**

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

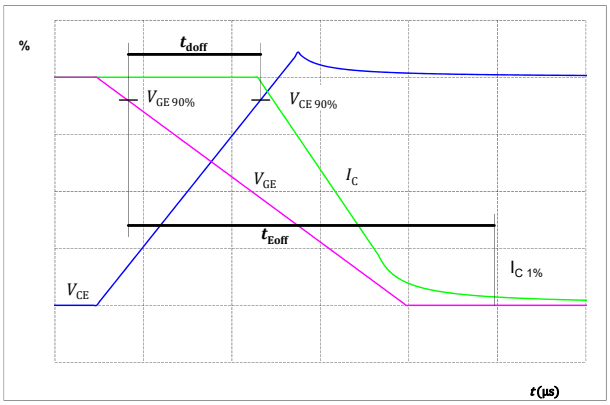


figure 52. **MOSFET**

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

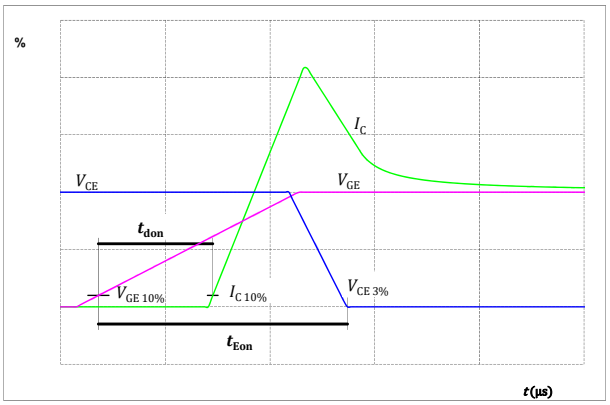


figure 53. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

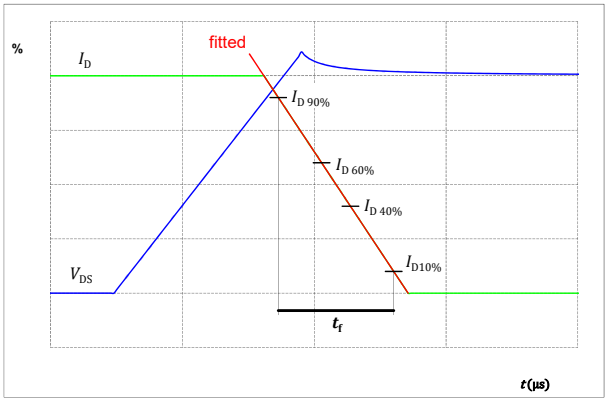
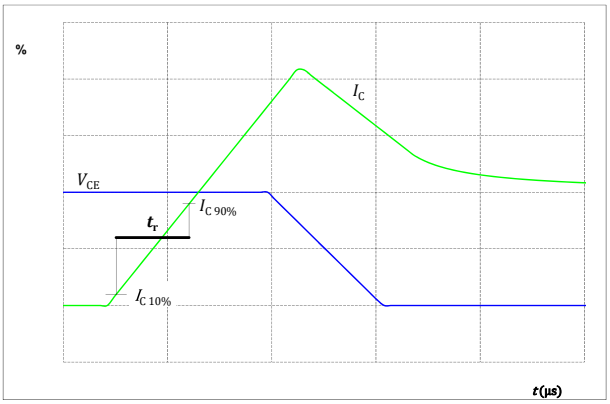


figure 54. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



PFC Switching Definitions

figure 55. **FWD**

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

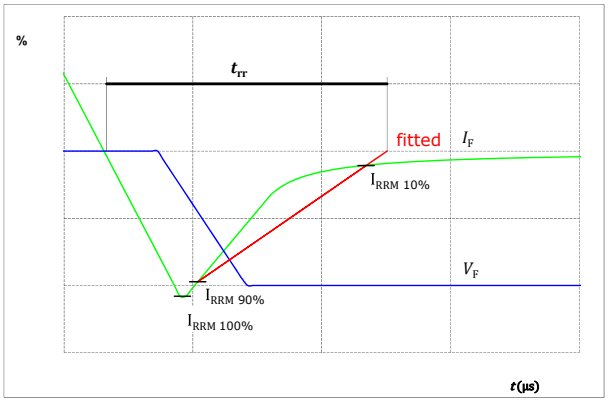


figure 56. **FWD**

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

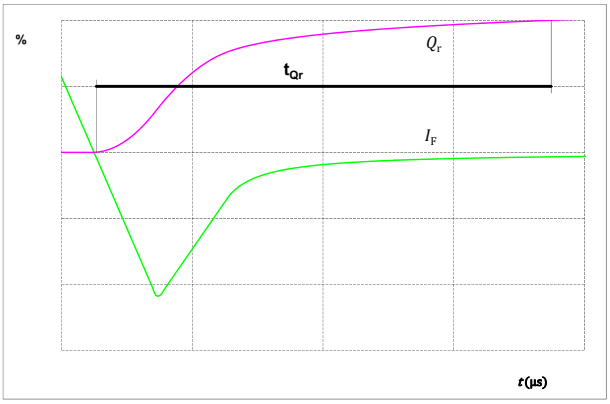
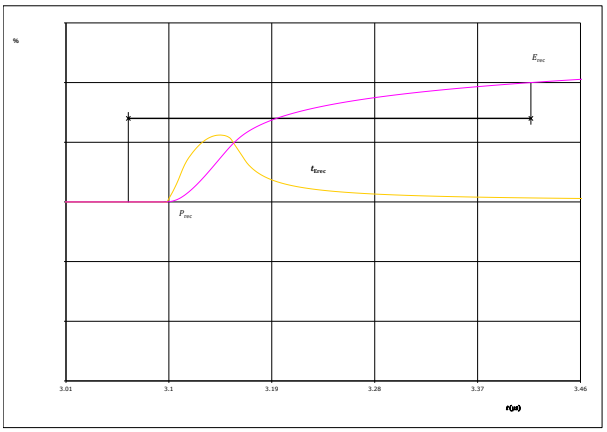


figure 57. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	10-P006PPA020SB03-M685B09Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-P006PPA020SB03-M685B09Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-P006PPA020SB03-M685B09Y-/3/

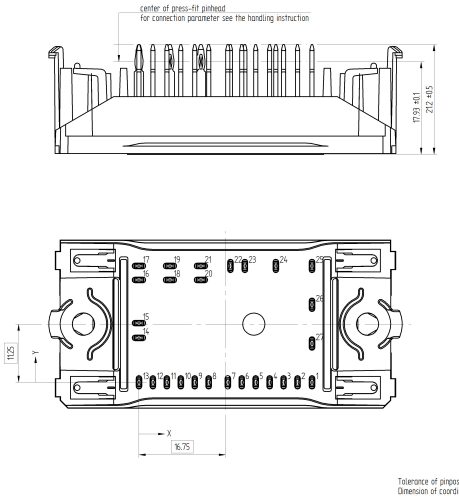
Marking

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

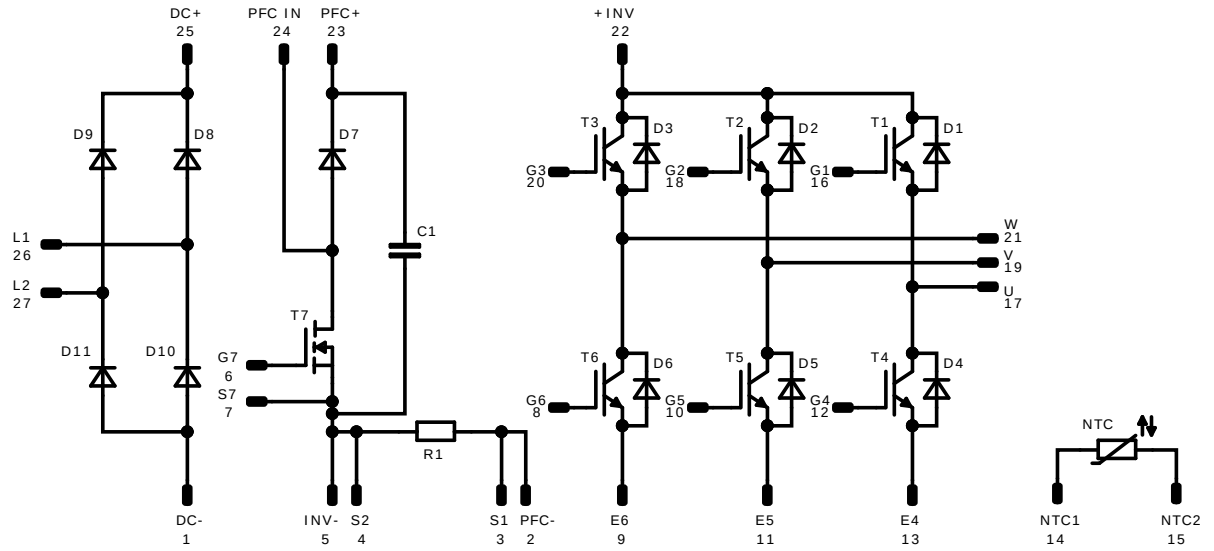
Outline

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	20 A	Inverter Switch	
D3, D6, D2, D5, D1, D4	FWD	600 V	30 A	Inverter Diode	
T7	MOSFET	600 V	49 mΩ	PFC Switch	
D7	FWD	600 V	30 A	PFC Diode	
D11, D9, D10, D8	Rectifier	1600 V	18 A	Rectifier Diode	
R1	Shunt			PFC Shunt	
C1	Capacitor	500 V		Capacitor (PFC)	
NTC	NTC			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-P006PPA020SB03-M685B09Y-D1-14	4 Feb. 2022	Initial Release	

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