



Vincotech

10-P006PPA010SB-M683BY

datasheet

flowPIM 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

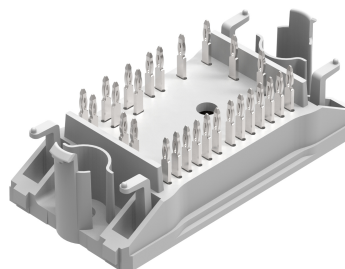
Target applications

- Industrial Drives
- Embedded Drives

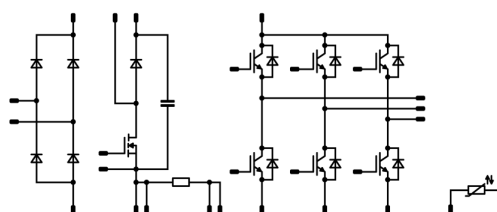
Types

- 10-P006PPA010SB-M683BY

flow 0 17 mm housing



Schematic





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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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Inverter Switch

Collector-emitter voltage	V_{CES}		600	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	17	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	44	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Inverter Diode

Peak repetitive reverse voltage	V_{RRM}		600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	17	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	32	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

PFC Switch

Drain-source voltage	V_{DSS}		600	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	18	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	112	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	72	W
Gate-source voltage	V_{GSS}		± 20	V
Maximum Junction Temperature	T_{jmax}		150	$^{\circ}\text{C}$



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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
PFC Diode				
Peak repetitive reverse voltage	V_{RRM}		600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	33	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	200	A
Surge current capability	I^2t		200	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	44	W
Maximum junction temperature	T_{jmax}		150	°C

PFC Shunt

DC current	I	$T_c = 70\text{ °C}$	15	A
Power dissipation	P_{tot}	$T_c = 70\text{ °C}$	5	W

Capacitor (PFC)

Maximum DC voltage	V_{MAX}		500	V
Operation Temperature	T_{op}		-55 ... 125	°C



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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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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* $t_p = 2\text{ s}$	6000	V
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance			min. 12,7	mm
Comparative Tracking Index	CTI		≥ 200	

*100 % tested in production



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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}	$f = 1 \text{ Mhz}$	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⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						2,15		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 32 \Omega$ $R_{goff} = 32 \Omega$	± 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}					25 125		0,277 0,376		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,33 0,449		mWs



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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				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⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						2,99		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=400$ A/μs $di/dt=467$ 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	$(di_{rr}/dt)_{max}$					25 125		21,2 64,56		A/μs



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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⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,97		K/W
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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}	$Q_{tFWD}=0,156$ μC $Q_{tFWD}=0,493$ μC				25 125		0,083 0,147		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,023 0,045		mWs



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10-P006PPA010SB-M683BY

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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⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,75		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=2470$ A/μs $di/dt=2378$ 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	$(di_{rr}/dt)_{max}$					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⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,59		K/W
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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 Shunt

Static

Resistance	R							20		mΩ
Tolerance							-1		1	%
Temperature coefficient	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}	$A_{R/R}$	$R_{100} = 1484 \Omega$				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.



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Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

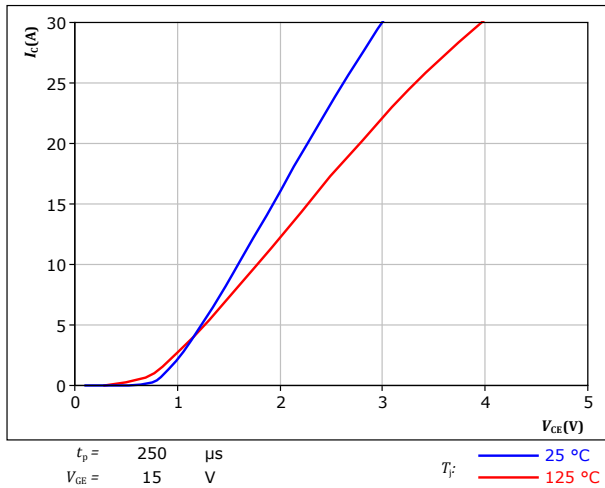


figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

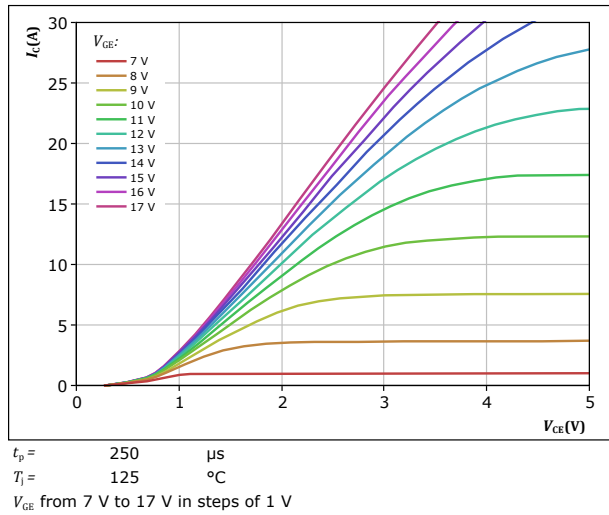


figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

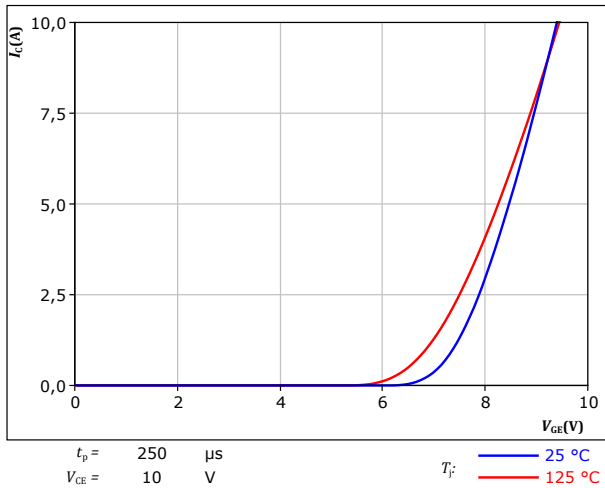
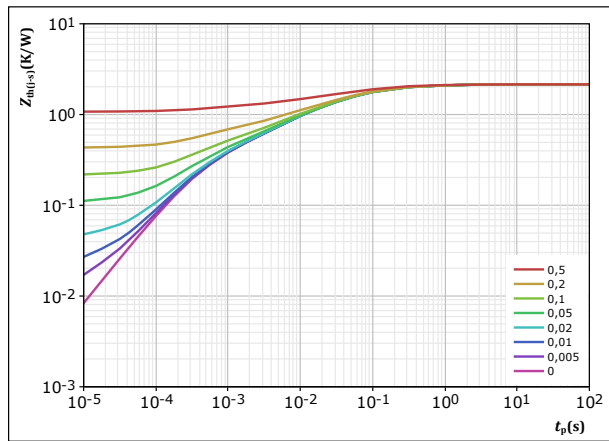


figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$R (K/W)$	$\tau (s)$
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



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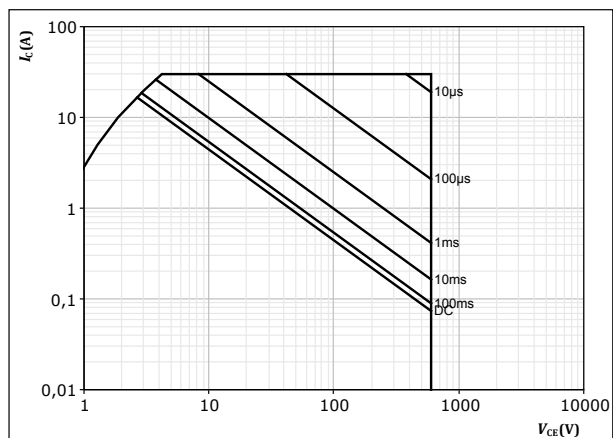
Inverter Switch Characteristics

figure 5.

IGBT

Safe operating area

$$I_C = f(V_{CE})$$



D = single pulse

$T_s = 80$ °C

$V_{GE} = 15$ V

$T_j = T_{jmax}$



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Inverter Diode Characteristics

figure 6.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

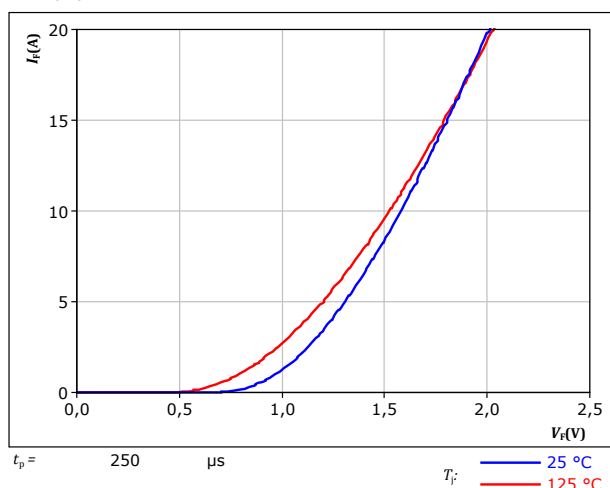
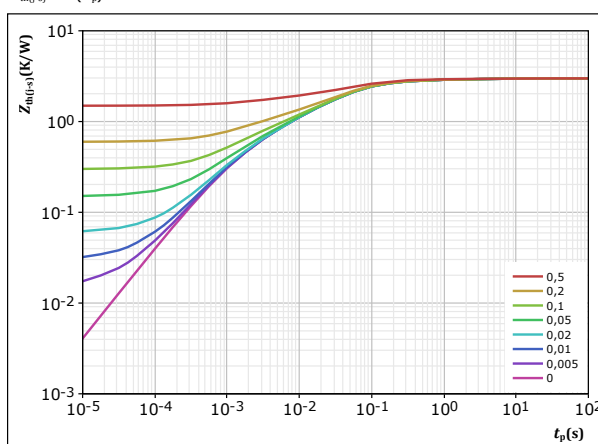


figure 7.

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	



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PFC Switch Characteristics

figure 8. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

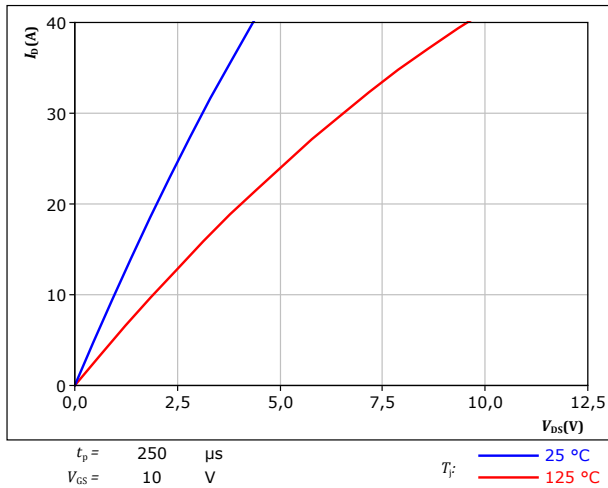


figure 9. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

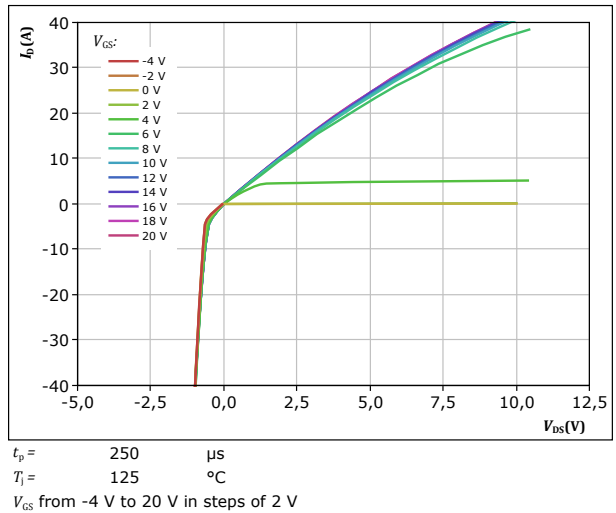


figure 10. MOSFET

Typical transfer characteristics

$$I_D = f(V_{GS})$$

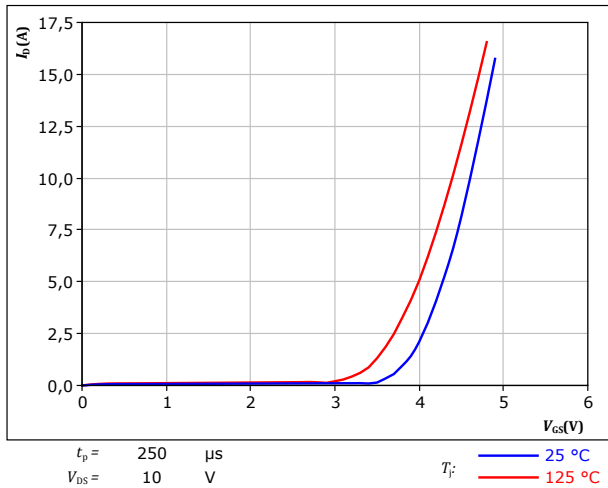
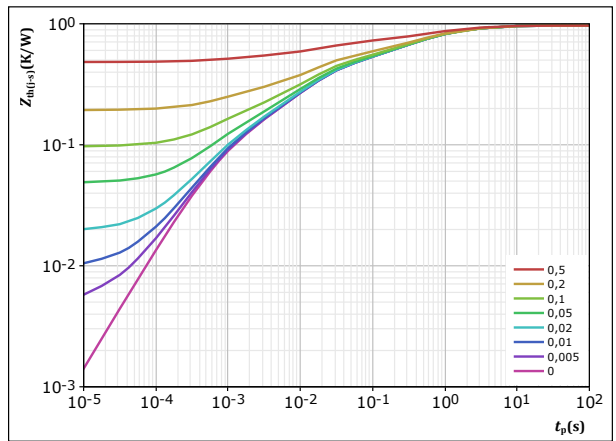


figure 11. MOSFET

Transient thermal impedance as a function of pulse width

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



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



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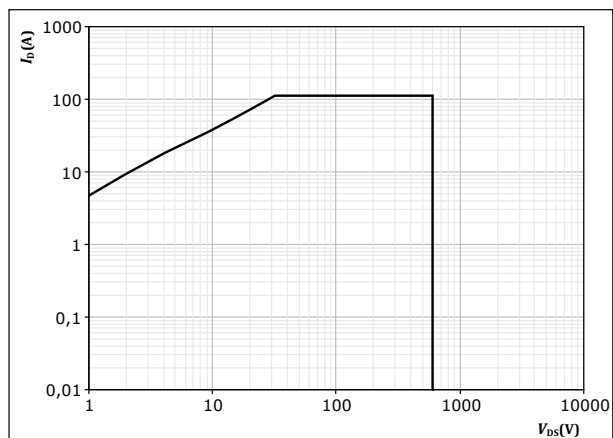
PFC Switch Characteristics

figure 12.

MOSFET

Safe operating area

$$I_D = f(V_{DS})$$



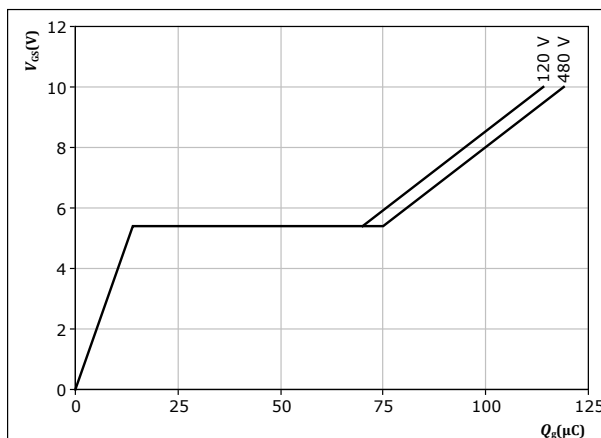
$D =$ single pulse
 $T_s = 80$ °C
 $V_{GS} = 10$ V
 $T_j = T_{jmax}$

figure 13.

MOSFET

Gate voltage vs gate charge

$$V_{GS} = f(Q_g)$$



$I_D = 18.1$ A
 $T_j = 25$ °C



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PFC Diode Characteristics

figure 14.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

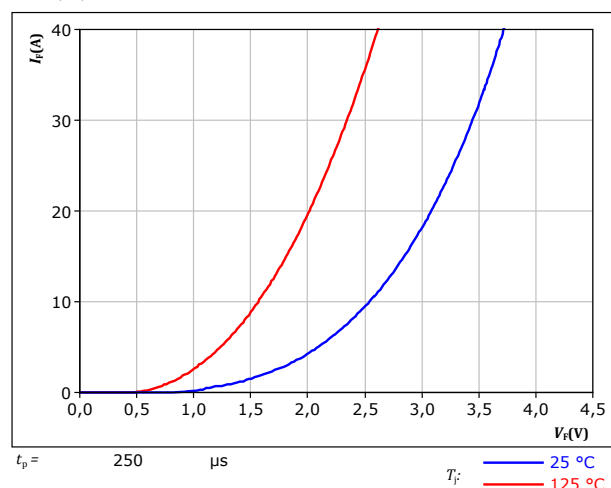
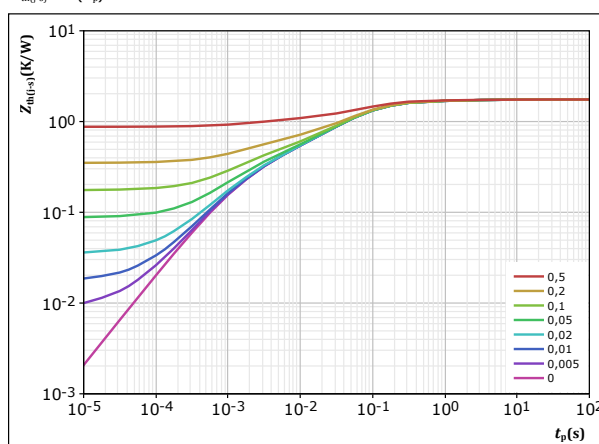


figure 15.

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	



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Rectifier Diode Characteristics

figure 16.

Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

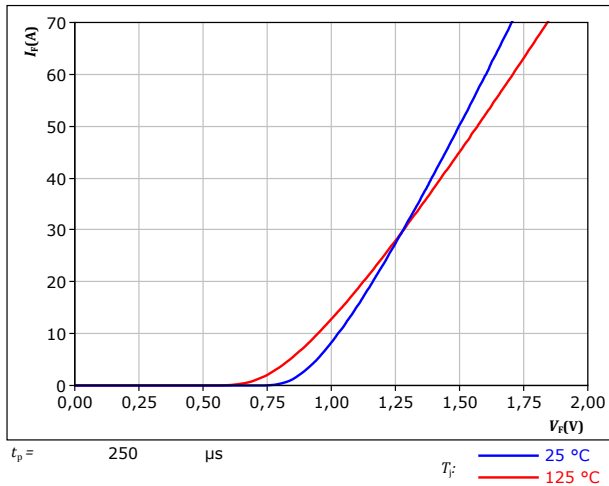
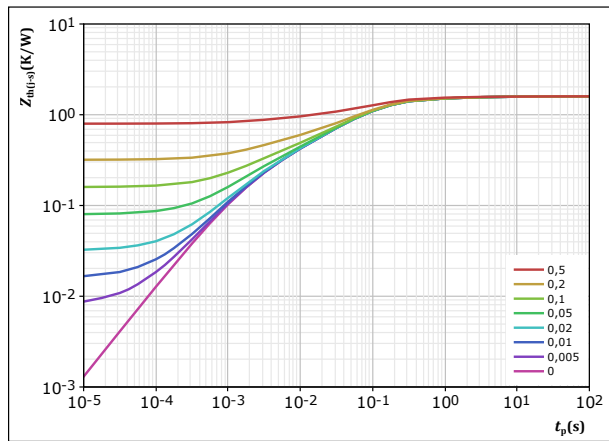


figure 17.

Rectifier

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$
$$R_{th(j-s)} = 1,594 \text{ K/W}$$

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



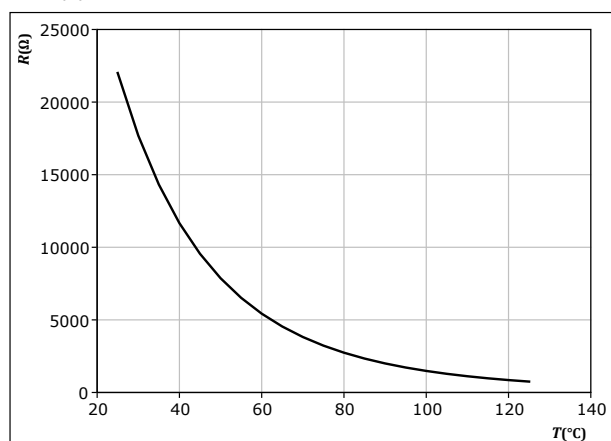
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Thermistor Characteristics

figure 18. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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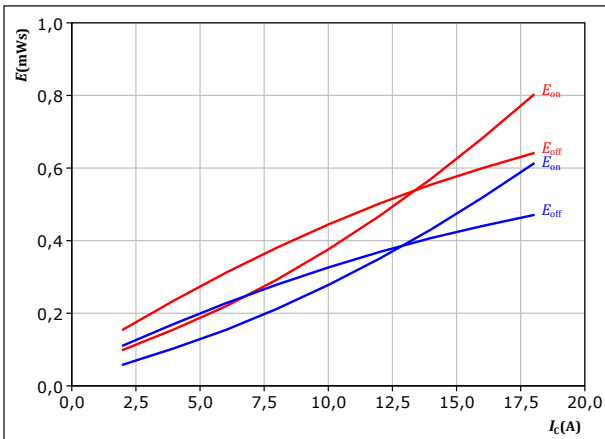
Inverter Switching Characteristics

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 32$ Ω
 $R_{goff} = 32$ Ω

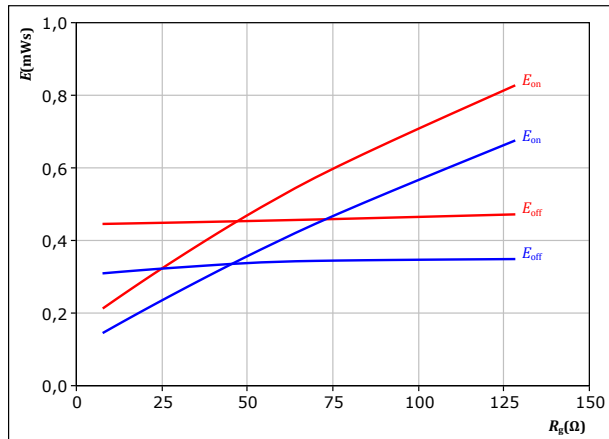
T_j : — 25 °C
— 125 °C

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
 $V_{GE} = \pm 15$ V
 $I_C = 10$ A

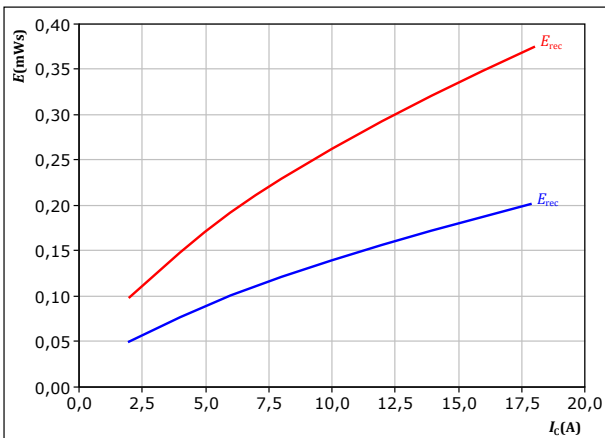
T_j : — 25 °C
— 125 °C

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 32$ Ω

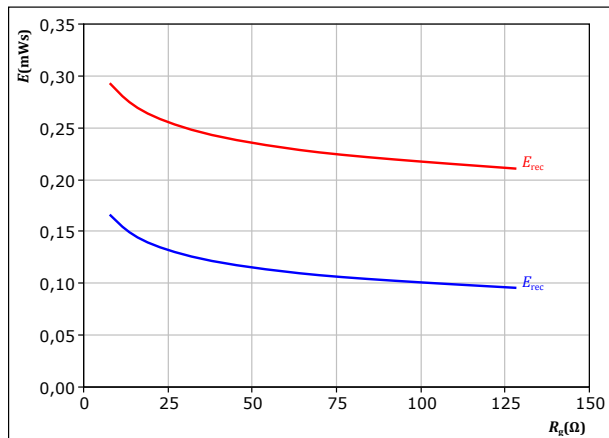
T_j : — 25 °C
— 125 °C

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
 $V_{GE} = \pm 15$ V
 $I_C = 10$ A

T_j : — 25 °C
— 125 °C



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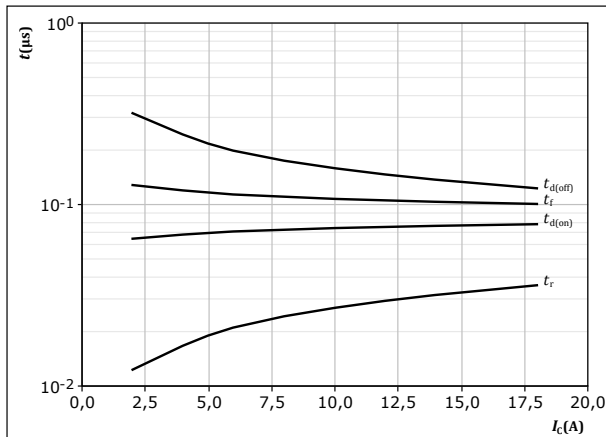
datasheet

Inverter Switching Characteristics

figure 23.

IGBT

Typical switching times as a function of collector current
 $t = f(I_C)$



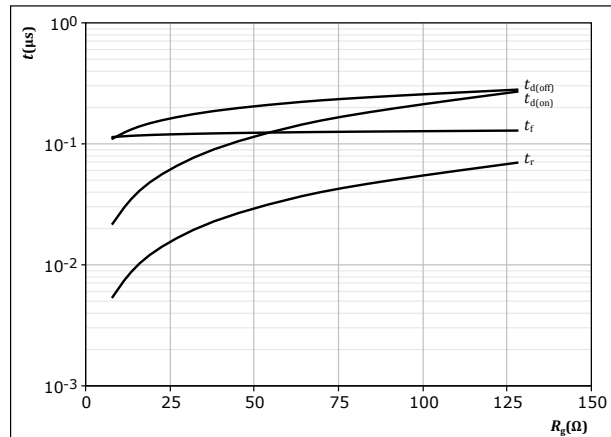
With an inductive load at

$T_j = 125 \text{ } ^\circ\text{C}$
 $V_{CE} = 400 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 32 \text{ } \Omega$
 $R_{goff} = 32 \text{ } \Omega$

figure 24.

IGBT

Typical switching times as a function of gate resistor
 $t = f(R_g)$



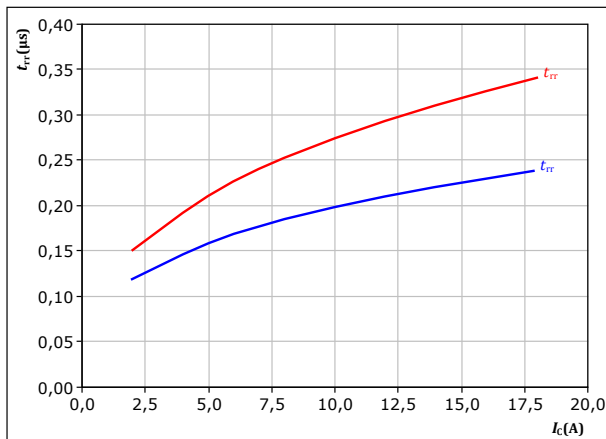
With an inductive load at

$T_j = 125 \text{ } ^\circ\text{C}$
 $V_{CE} = 400 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 10 \text{ A}$

figure 25.

FWD

Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_C)$



With an inductive load at

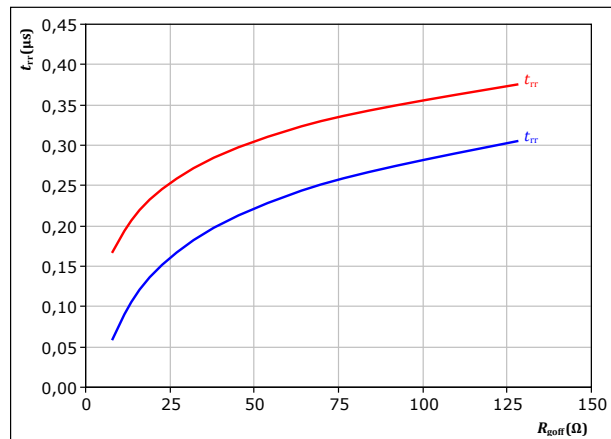
$V_{CE} = 400 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 32 \text{ } \Omega$

T_j : — 25 $^\circ\text{C}$
— 125 $^\circ\text{C}$

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

$V_{CE} = 400 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 10 \text{ A}$

T_j : — 25 $^\circ\text{C}$
— 125 $^\circ\text{C}$



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10-P006PPA010SB-M683BY
datasheet

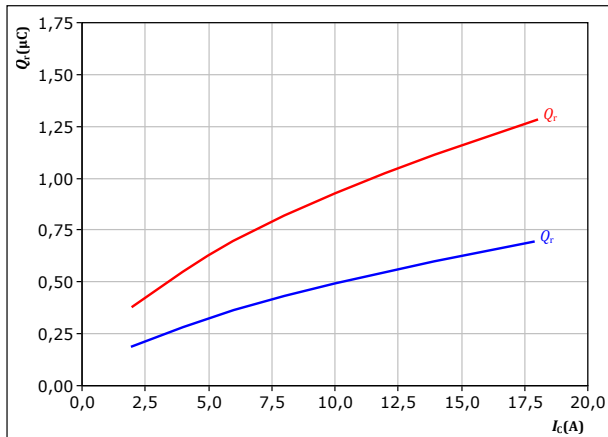
Inverter Switching Characteristics

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 32$ Ω

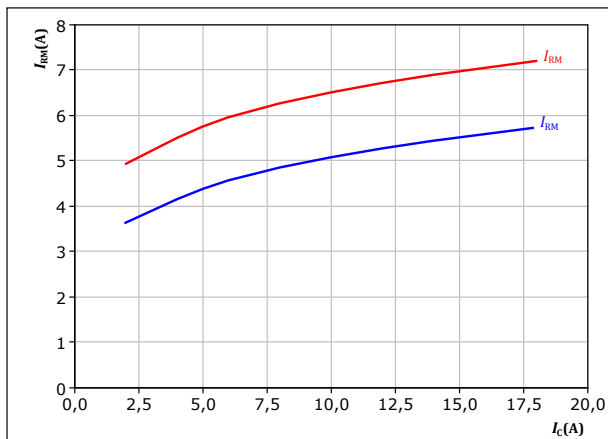
T_j : — 25 °C
— 125 °C

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 32$ Ω

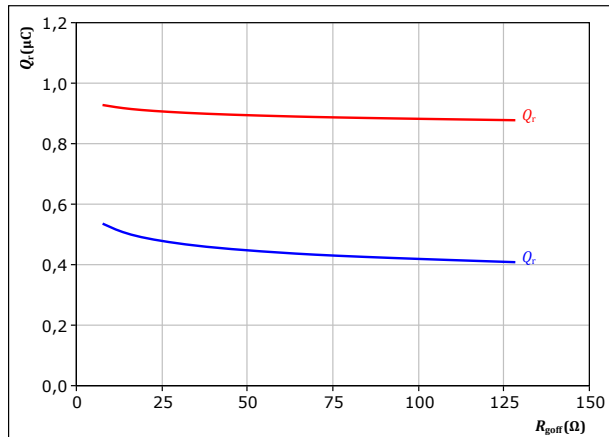
T_j : — 25 °C
— 125 °C

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
 $V_{GE} = \pm 15$ V
 $I_c = 10$ A

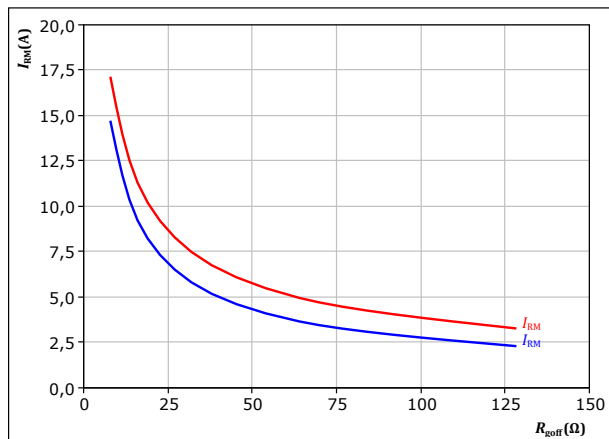
T_j : — 25 °C
— 125 °C

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
 $V_{GE} = \pm 15$ V
 $I_c = 10$ A

T_j : — 25 °C
— 125 °C



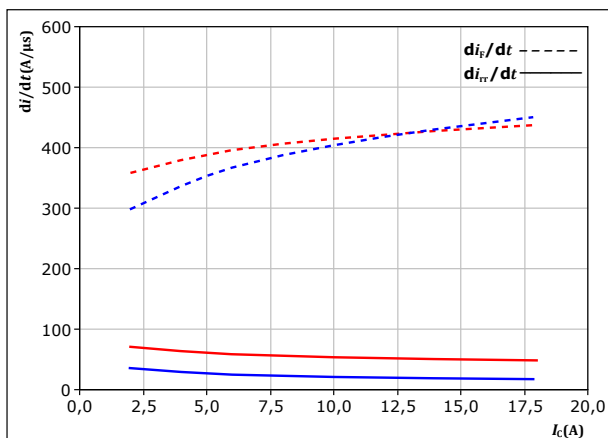
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Inverter Switching Characteristics

figure 31. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_r/dt = f(I_C)$



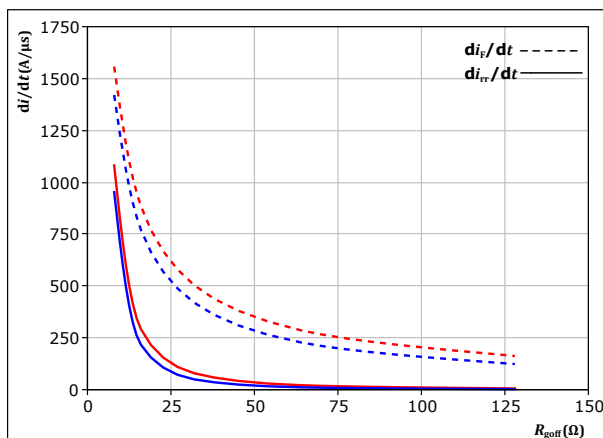
With an inductive load at

$V_{CE} = 400$ V
 $V_{GE} = \pm 15$ 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
 $di_f/dt, di_r/dt = f(R_{goff})$



With an inductive load at

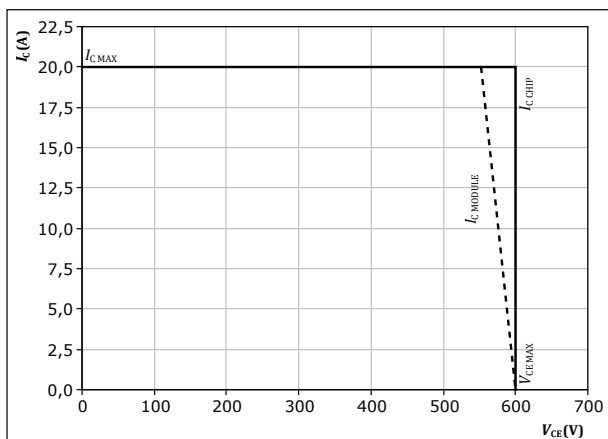
$V_{CE} = 400$ V
 $V_{GE} = \pm 15$ V
 $I_C = 10$ A

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



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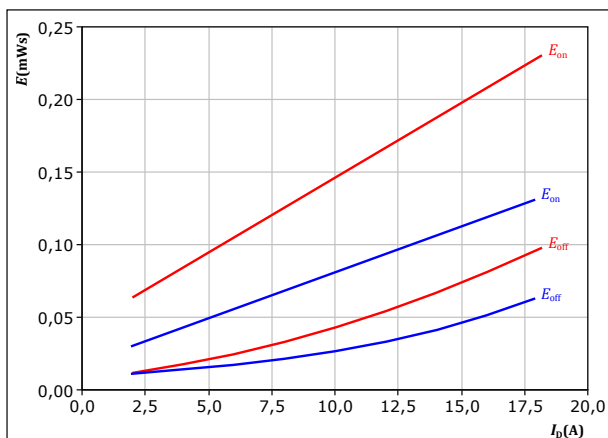
PFC Switching Characteristics

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
 $V_{GS} = 0/10$ V
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω

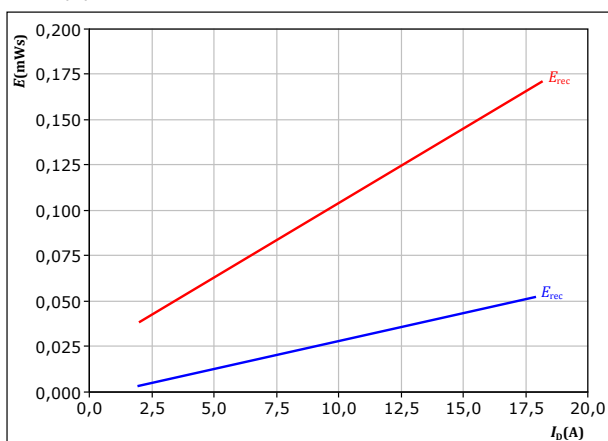
T_j : 25 °C
125 °C

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
 $V_{GS} = 0/10$ V
 $R_{gon} = 8$ Ω

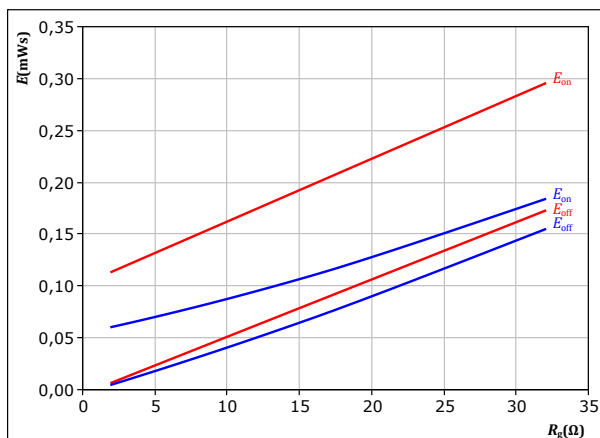
T_j : 25 °C
125 °C

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
 $V_{GS} = 0/10$ V
 $I_D = 10$ A

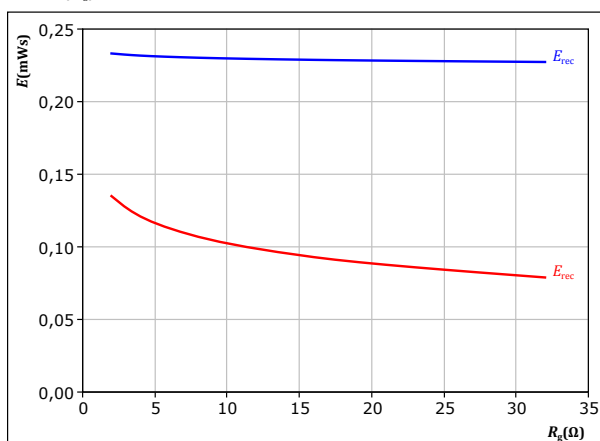
T_j : 25 °C
125 °C

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
 $V_{GS} = 0/10$ V
 $I_D = 10$ A

T_j : 25 °C
125 °C



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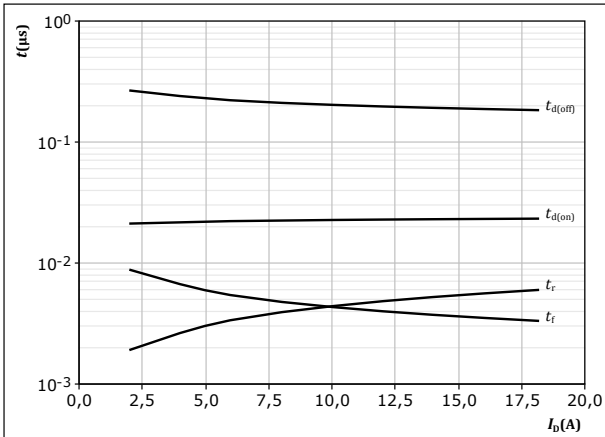
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datasheet

PFC Switching Characteristics

figure 38.

MOSFET

Typical switching times as a function of drain current
 $t = f(I_D)$



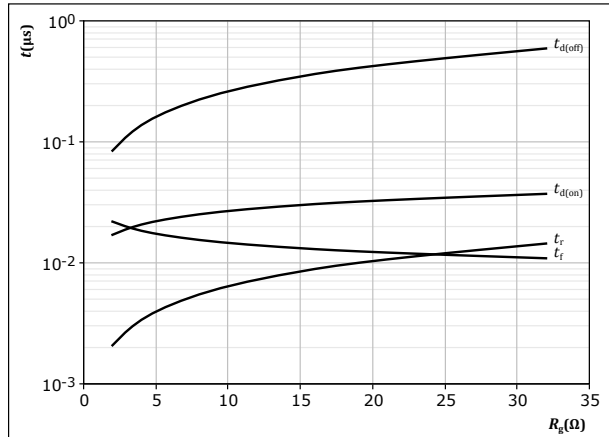
With an inductive load at

$T_j = 125$ °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
 $t = f(R_g)$



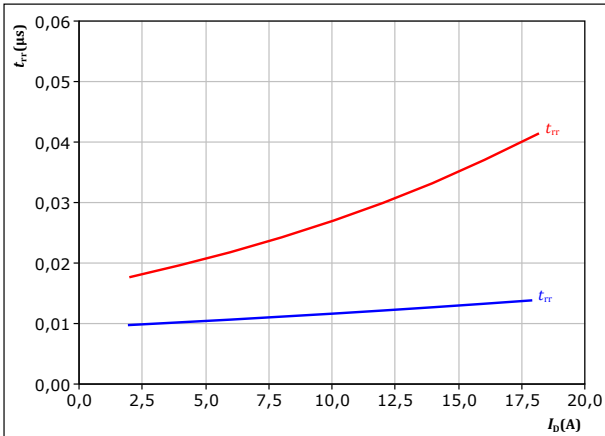
With an inductive load at

$T_j = 125$ °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
 $t_{rr} = f(I_D)$

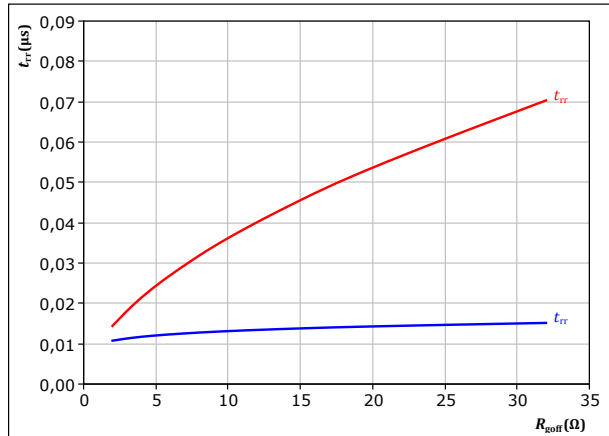


At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $R_{gon} = 8$ Ω
 T_j : — 25 °C
— 125 °C

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



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10-P006PPA010SB-M683BY
datasheet

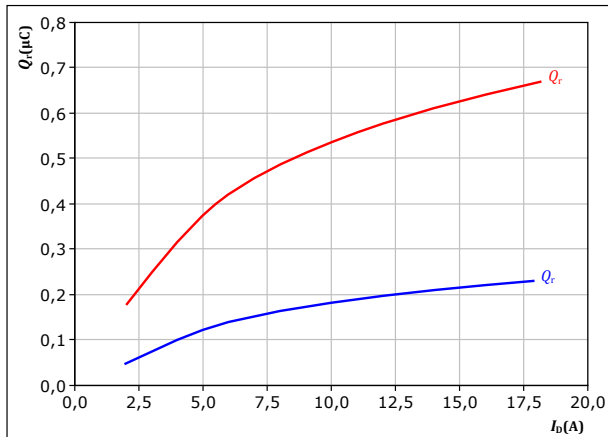
PFC Switching Characteristics

figure 42.

FWD

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



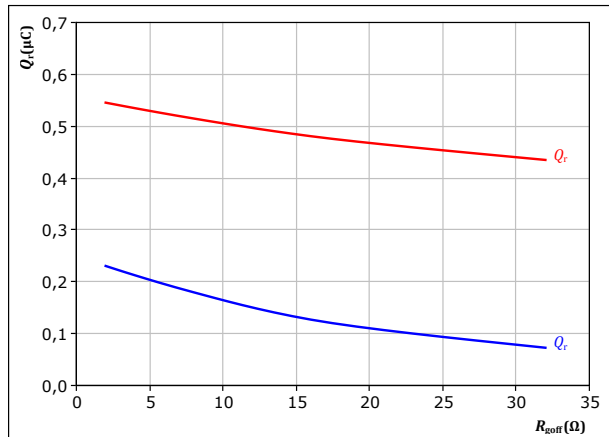
At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $R_{gon} = 8$ Ω
 T_j : — 25 °C
— 125 °C

figure 43.

FWD

Typical recovered charge as a function of turn off gate resistor

$$Q_r = f(R_{goff})$$



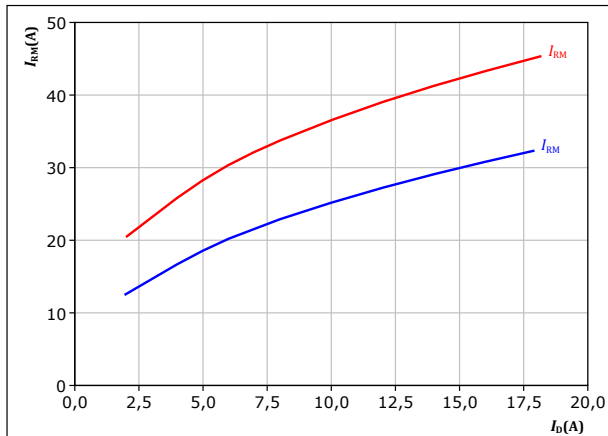
At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $I_D = 10$ A
 T_j : — 25 °C
— 125 °C

figure 44.

FWD

Typical peak reverse recovery current as a function of drain current

$$I_{RM} = f(I_D)$$



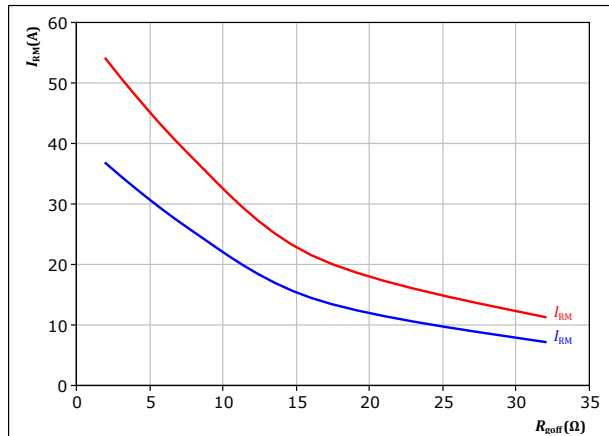
At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $R_{gon} = 8$ Ω
 T_j : — 25 °C
— 125 °C

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



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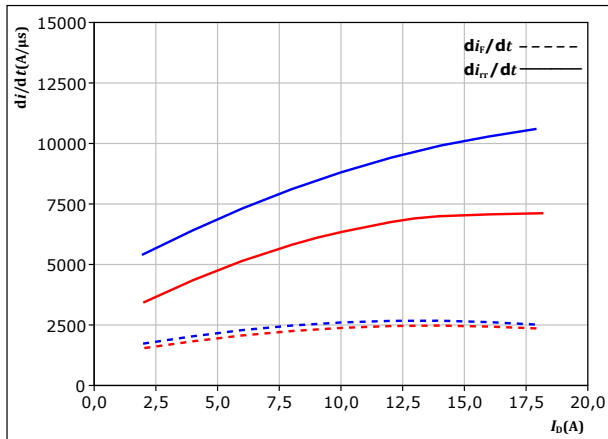
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PFC Switching Characteristics

figure 46. FWD

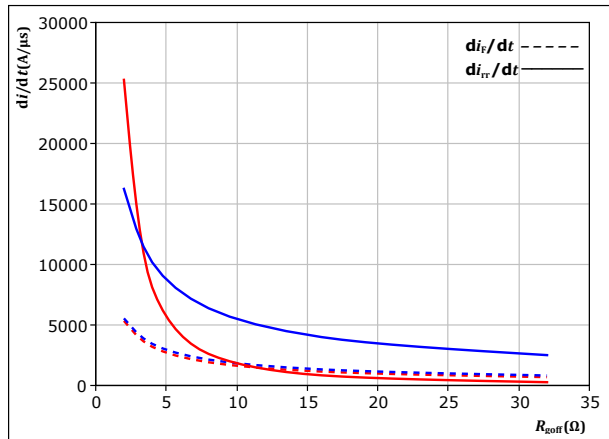
Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_f/dt, di_r/dt = f(I_D)$



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

figure 47. FWD

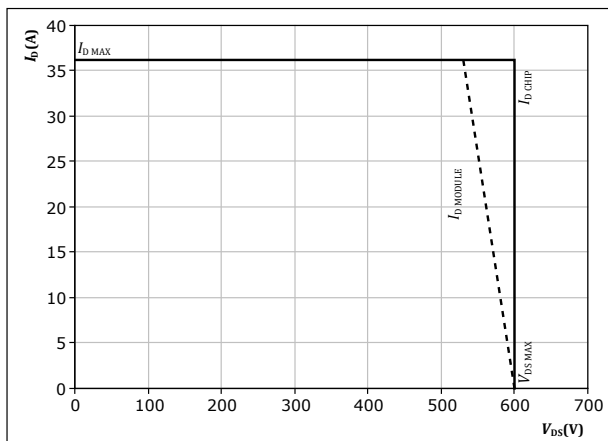
Typical rate of fall of forward and reverse recovery current as a function of turn off gate resistor
 $di_f/dt, di_r/dt = f(R_{goff})$



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

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



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Inverter Switching Definitions

figure 49. IGBT

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

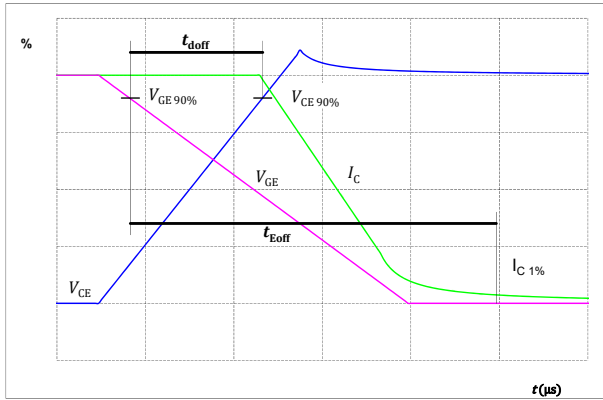


figure 50. IGBT

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

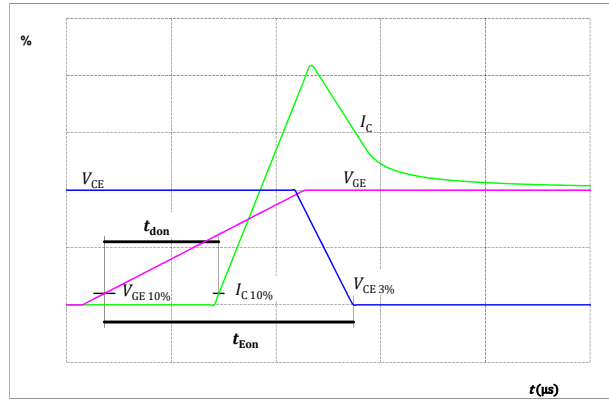


figure 51. IGBT

Turn-off Switching Waveforms & definition of t_f

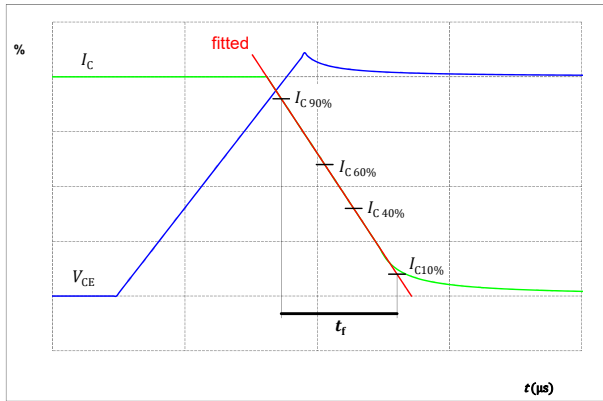
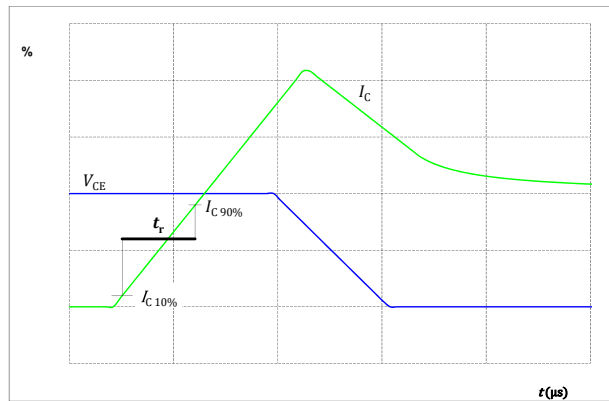


figure 52. IGBT

Turn-on Switching Waveforms & definition of t_r





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Inverter Switching Definitions

figure 53.

FWD

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

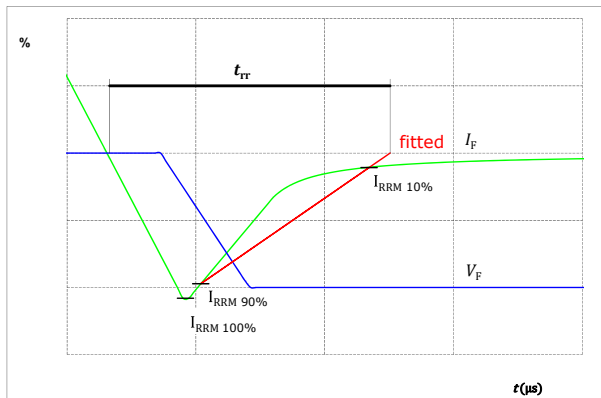
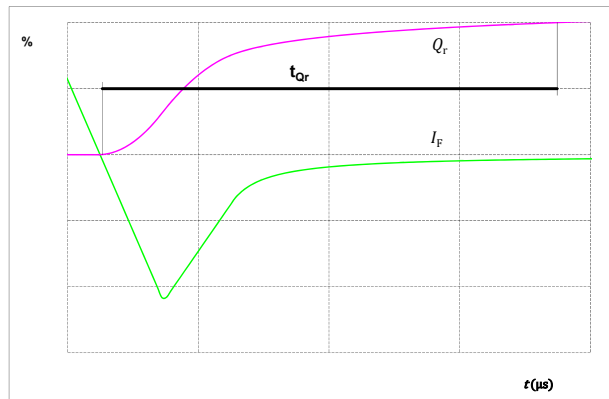


figure 54.

FWD

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





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PFC Switching Definitions

figure 49. MOSFET

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

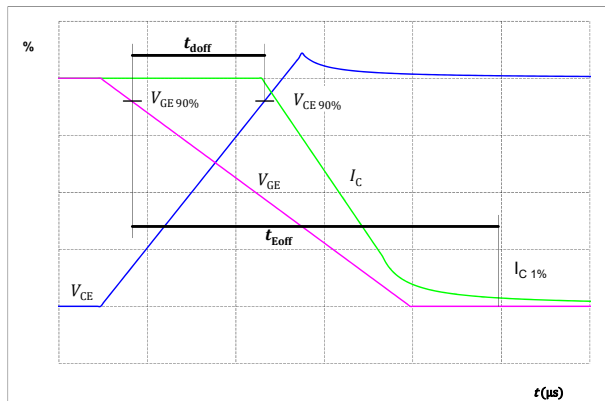


figure 50. MOSFET

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

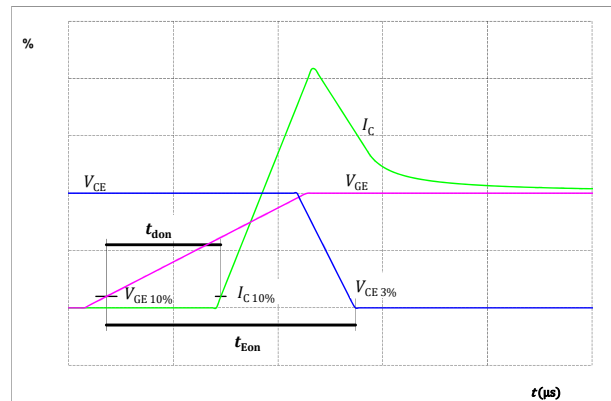


figure 51. MOSFET

Turn-off Switching Waveforms & definition of t_f

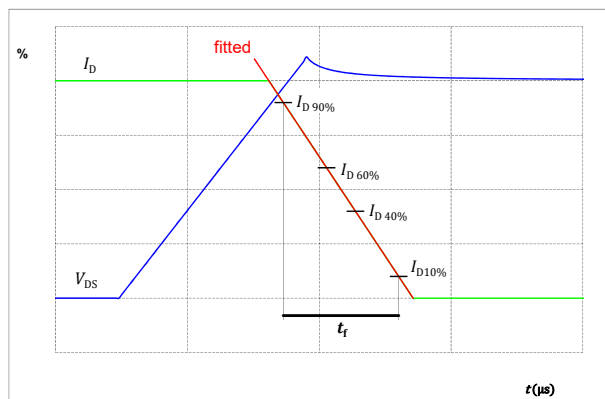
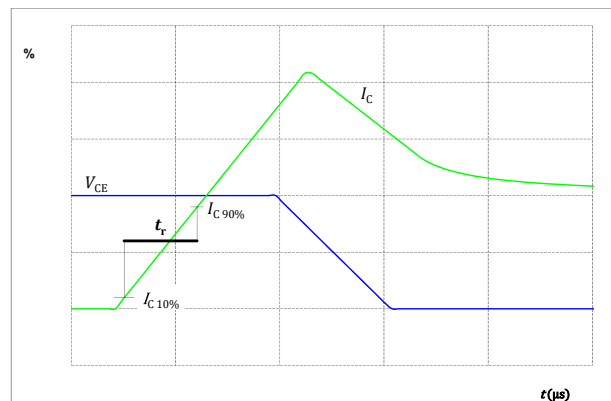


figure 52. MOSFET

Turn-on Switching Waveforms & definition of t_r





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PFC Switching Definitions

figure 53.

FWD

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

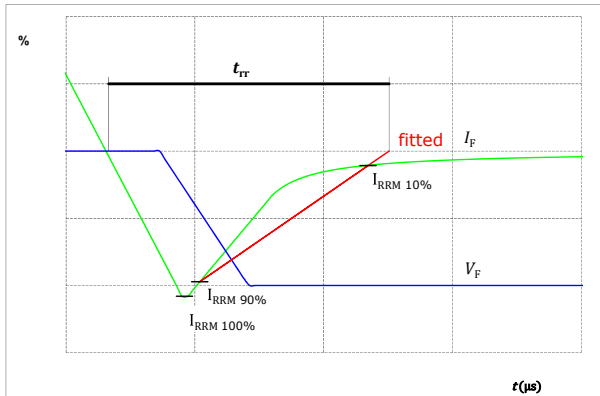


figure 54.

FWD

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

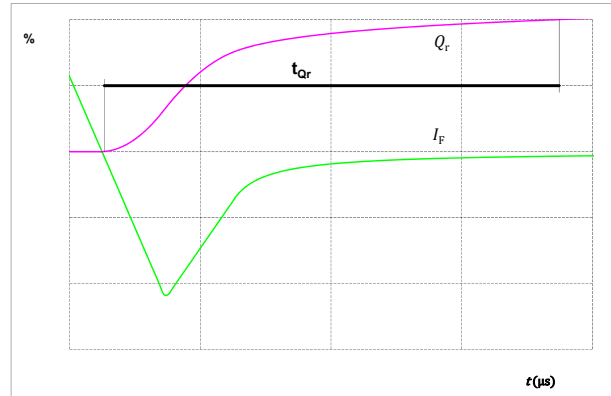
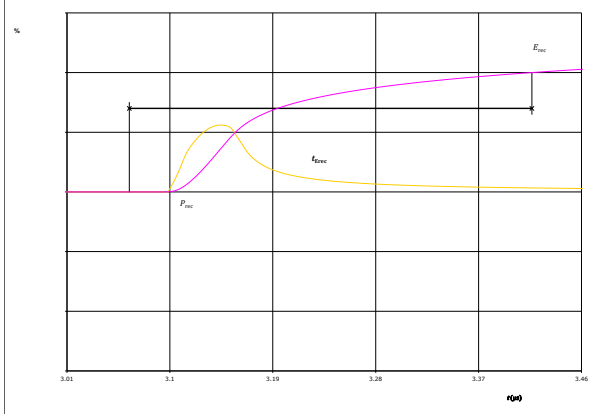


figure 55.

FWD


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

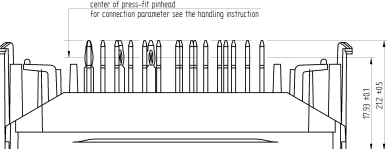
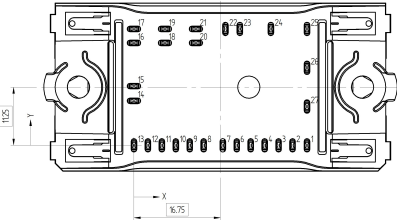




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Ordering Code	
Version	Ordering Code
Without thermal paste	10-P006PPA010SB-M683BY
With thermal paste (5,2 W/mK, PTM6000HV)	10-P006PPA010SB-M683BY-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-P006PPA010SB-M683BY-/3/

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

Pin table [mm]				Outline	
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		
					
					
				Tolerance of pinpositions: ±0,5mm at the end of pins Dimension of coordinate axis is only offset without tolerance	

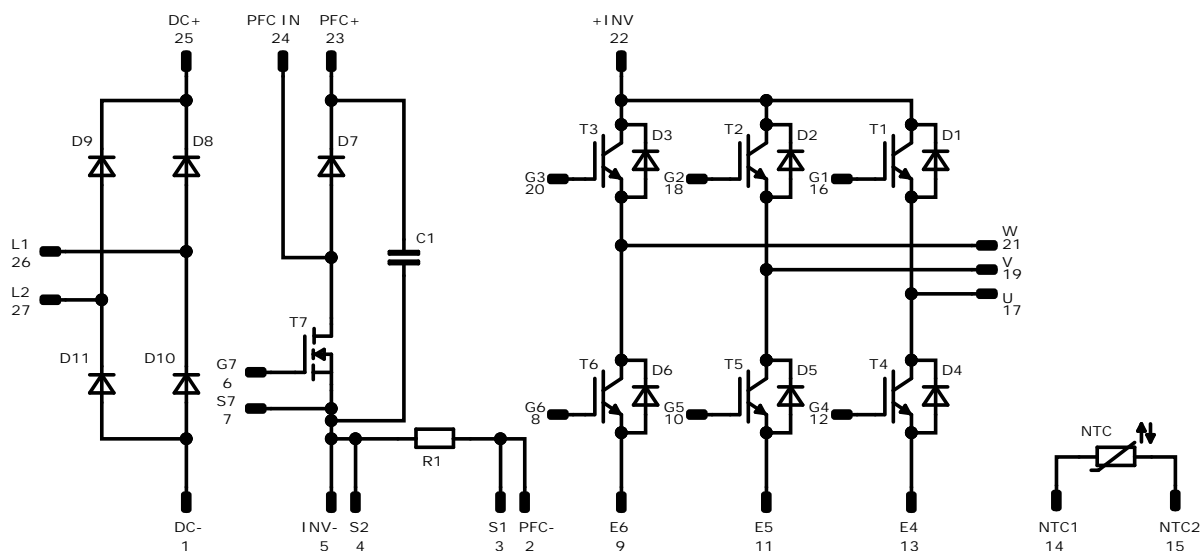


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10-P006PPA010SB-M683BY

datasheet

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	



Vincotech

10-P006PPA010SB-M683BY
datasheet

Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</i> 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	

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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.