Vincotech

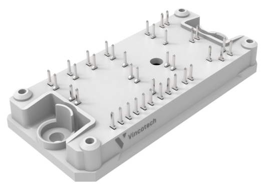
10-FE06PPA020SJ01-LK23B58Z
datasheet

***flow*PIM 1 + PFC** **600 V / 20 A**

Features

- PIM with interleaved PFC circuit based on bridgeless technology
- New generation high speed IGBTs in the Inverter
- Integrated temperature sensor

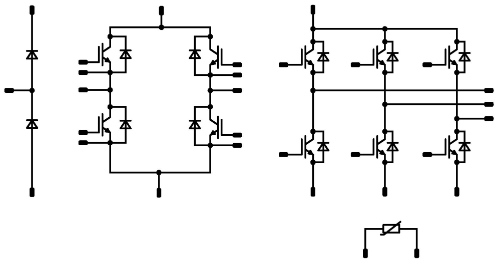
flow 1 12 mm housing



Target applications

- Embedded Drives

Schematic



Types

- 10-FE06PPA020SJ01-LK23B58Z

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	24	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	57	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 400 V	T_j = 150 °C	5	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	24	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	48	W
Maximum junction temperature	T_{jmax}			175	°C
PFC Switch					
Collector-emitter voltage	V_{CES}			650	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	55	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
PFC Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	41	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	66	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	62	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	400	A
Surge current capability	I^2t			800	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	74	W
Maximum junction temperature	T_{jmax}			150	°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				>12.7mm	mm
Clearance				7.81mm	mm
Comparative Tracking Index	CTI			≥ 600	

*100 % tested in production

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 Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00028	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		20	25 125 150		1,83 2,06 2,12	1,8(1)	V
Collector-emitter cut-off current	I_{CES}		0	600		25			0,6	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		700		pF
Reverse transfer capacitance	C_{res}	f = 1 Mhz	0	25		25		24		pF
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,67		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	20	25 125 150		60,32 59,2 59,36		ns
Rise time	t_r	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	20	25 125 150		30,08 31,2 31,2		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	20	25 125 150		86,88 107,36 111,84		ns
Fall time	t_f	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	350	20	25 125 150		22,21 38,32 43,74		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,559 µC Q_{rFWD}=1,21 µC Q_{rFWD}=1,48 µC	±15	350	20	25 125 150		0,414 0,55 0,588		mWs
Turn-off energy (per pulse)	E_{off}		±15	350	20	25 125 150		0,229 0,369 0,403		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				15	25 125 150	1,25	1,76 1,66 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)						1,99		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=537 A/µs di/dt=702 A/µs di/dt=573 A/µs	±15	350	20	25 125 150		6,64 9,71 10,67		A
Reverse recovery time	t_{rr}					25 125 150		198,64 271,14 309,91		ns
Recovered charge	Q_r					25 125 150		0,559 1,21 1,48		µC
Reverse recovered energy	E_{rec}					25 125 150		0,138 0,303 0,378		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		30,78 67,04 68,48		A/µs

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 Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0002	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		20	25 125 150		1,61 1,76 1,79	2,22(1)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			40	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		1200		pF
Reverse transfer capacitance	C_{res}	f = 1 Mhz	0	25		25		5,2		pF
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,73		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	0/15	400	20	25 125 150		21,12 20,16 20,16		ns
Rise time	t_r	R_{gon} = 16 Ω R_{goff} = 16 Ω	0/15	400	20	25 125 150		8,64 9,6 9,92		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	0/15	400	20	25 125 150		104,96 120,96 125,44		ns
Fall time	t_f	R_{gon} = 16 Ω R_{goff} = 16 Ω	0/15	400	20	25 125 150		6,94 9,49 10,66		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,412 µC Q_{rFWD}=1,16 µC Q_{rFWD}=1,45 µC	0/15	400	20	25 125 150		0,334 0,537 0,6		mWs
Turn-off energy (per pulse)	E_{off}		0/15	400	20	25 125 150		0,134 0,219 0,242		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				5	25 125 150		1,36 0,917 0,837	1,8[1]	V
Reverse leakage current	I_R	V_r = 650 V				25			5	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,44		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=2226 A/µs d*i*/d*t*=1935 A/µs d*i*/d*t*=1868 A/µs	0/15	400	20	25 125 150		17,46 33,85 40,08		A
Reverse recovery time	t_{rr}					25 125 150		52,85 72,29 78,4		ns
Recovered charge	Q_r					25 125 150		0,412 1,16 1,45		µC
Reverse recovered energy	E_{rec}					25 125 150		0,082 0,248 0,319		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		1657 1182 1421		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				5	25 125 150		0,875 0,764 0,748	1,1[1]	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			100 2000	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,94		K/W
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-12		14	%
Power dissipation	P							200		mW
Power dissipation constant	d					25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3 %						3950		K
B-value	$B_{(25/100)}$	Tol. ±3 %						3998		K
Vincotech Thermistor Reference									B	

(1) Value at chip level

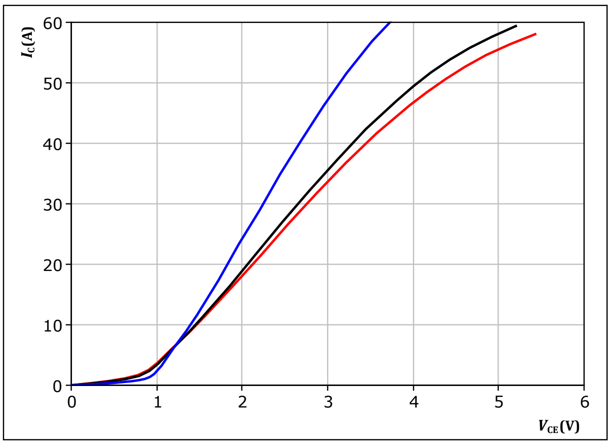
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

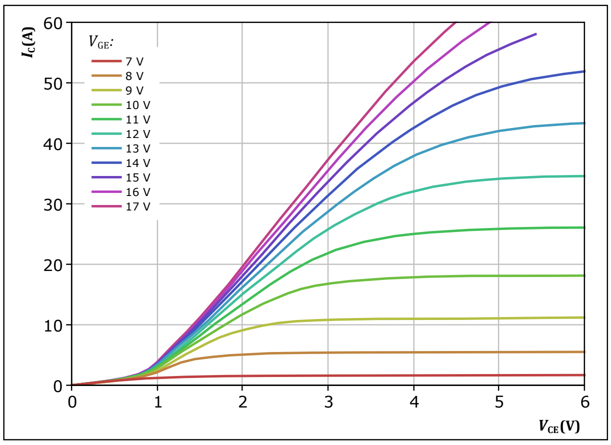


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



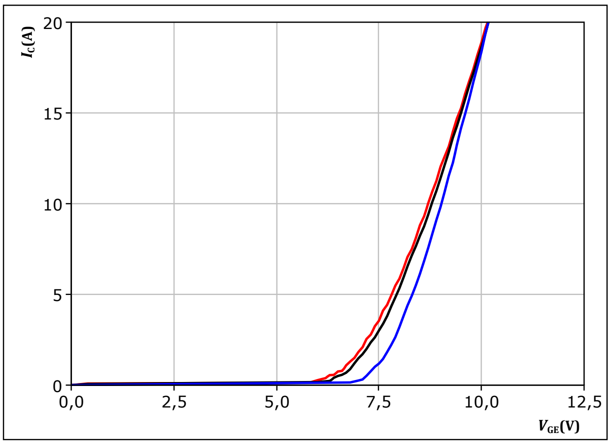
t_p =	250	µs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

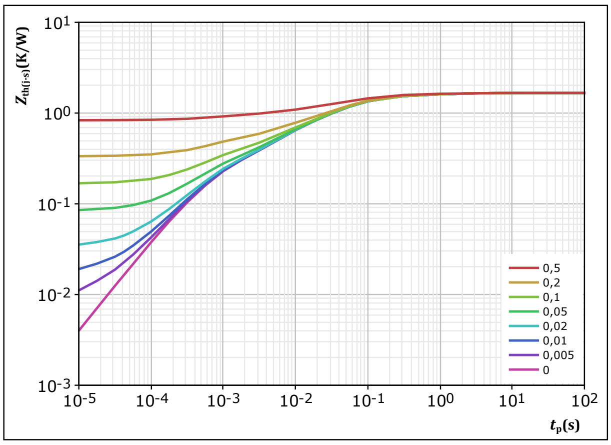


t_p =	250	µs		25 °C
V_{CE} =	15	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,667	K/W

IGBT thermal model values

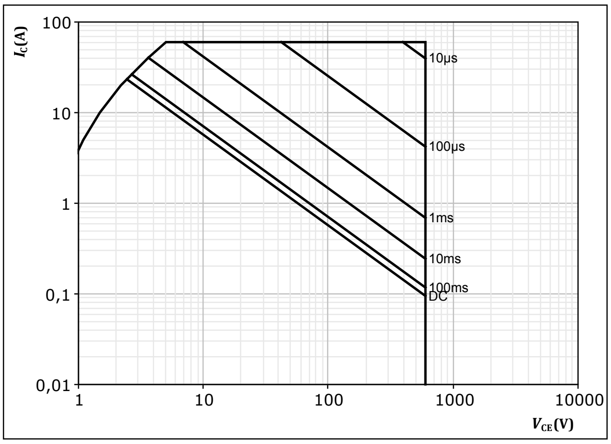
R (K/W)	τ (s)
8,37E-02	1,97E+00
1,98E-01	2,51E-01
7,72E-01	5,06E-02
4,11E-01	7,66E-03
2,02E-01	6,07E-04

Inverter Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



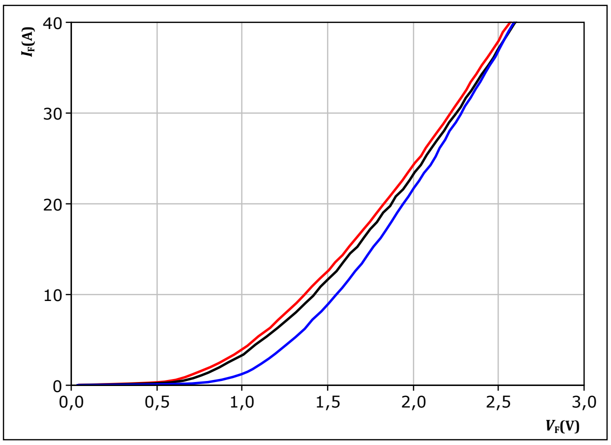
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



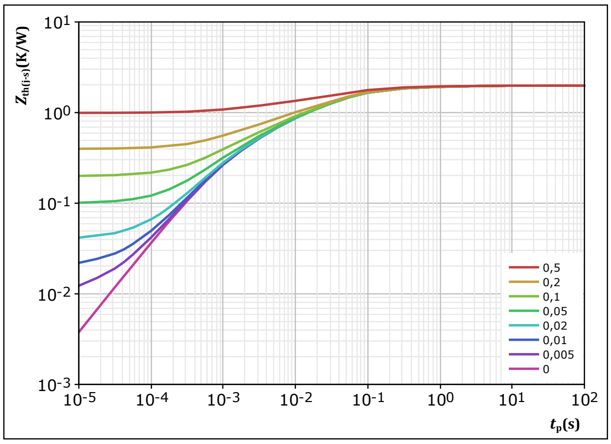
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,985 K/W

FWD thermal model values

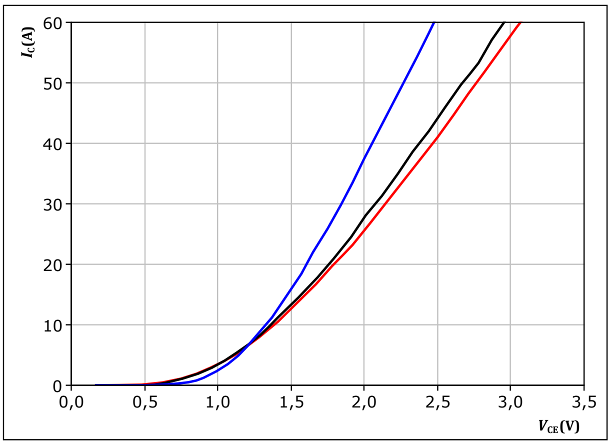
R (K/W)	τ (s)
8,91E-02	2,42E+00
2,69E-01	2,03E-01
8,60E-01	4,06E-02
5,20E-01	6,04E-03
2,47E-01	9,13E-04

PFC Switch Characteristics

figure 8. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

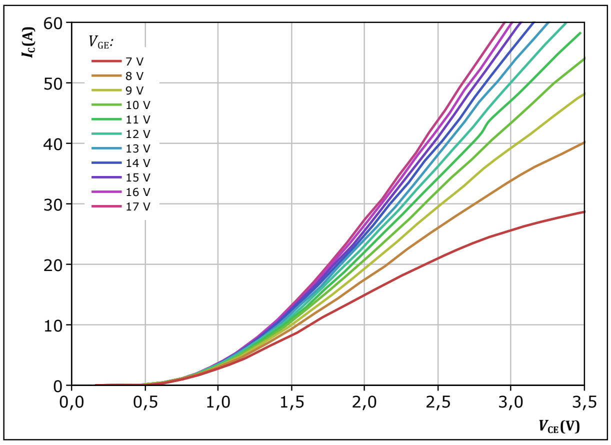


t_p =	250	μs	T_j:	25 °C
V_{GE} =	15	V		125 °C
				150 °C

figure 9. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



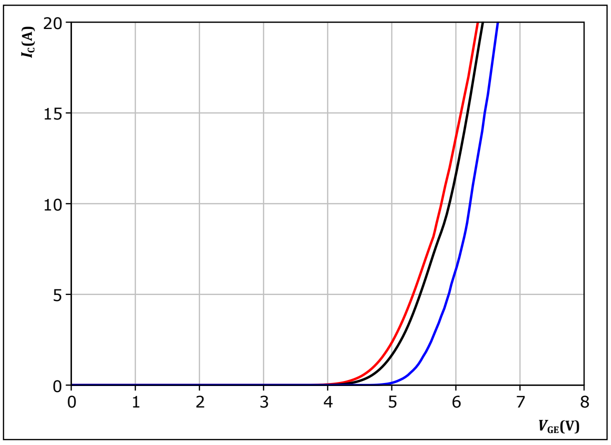
t_p =	250	μs
T_j =	150	°C

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

figure 10. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

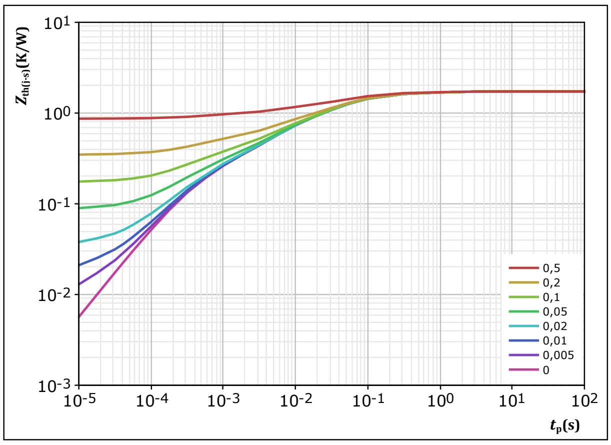


t_p =	250	μs	T_j:	25 °C
V_{CE} =	10	V		125 °C
				150 °C

figure 11. **IGBT**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,732 K/W

IGBT thermal model values

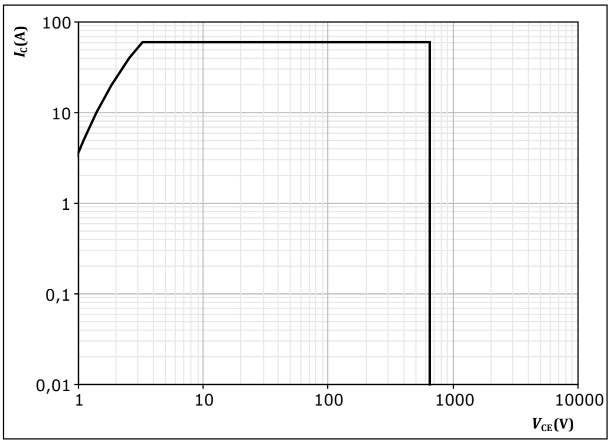
R (K/W)	τ (s)
1,16E-01	1,03E+00
4,05E-01	1,11E-01
6,61E-01	2,97E-02
3,73E-01	4,53E-03
1,76E-01	3,79E-04

PFC Switch Characteristics

figure 12.	IGBT

Safe operating area

I_C = f(V_{CE})



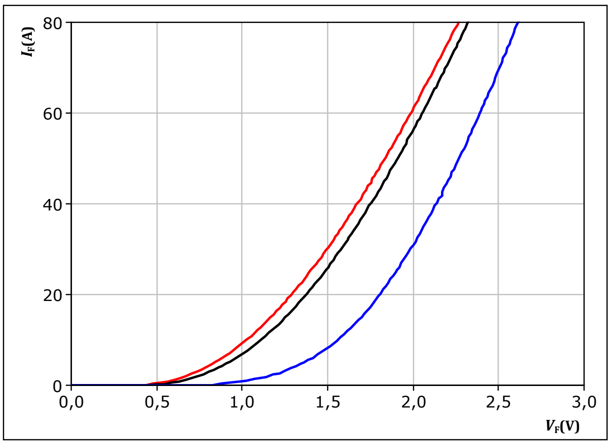
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

PFC Diode Characteristics

figure 13. **FWD**

Typical forward characteristics

I_F = f(V_F)



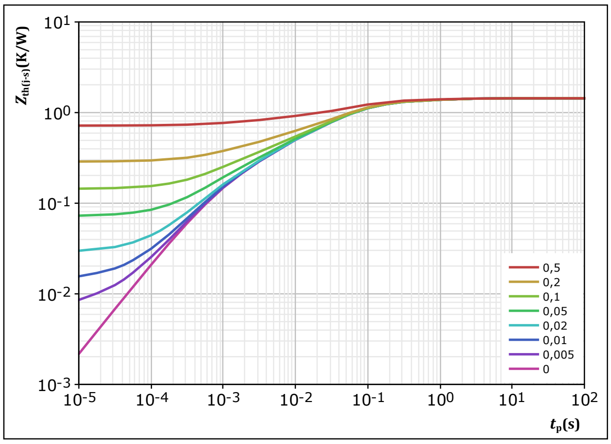
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 14. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,437 K/W

FWD thermal model values

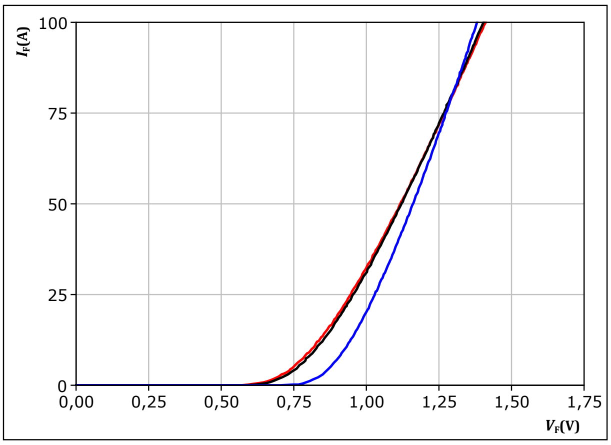
R (K/W)	τ (s)
1,12E-01	1,29E+00
3,84E-01	1,31E-01
5,77E-01	3,59E-02
2,49E-01	4,89E-03
1,15E-01	7,76E-04

Rectifier Diode Characteristics

figure 15.	Rectifier

Typical forward characteristics

I_F = f(V_F)



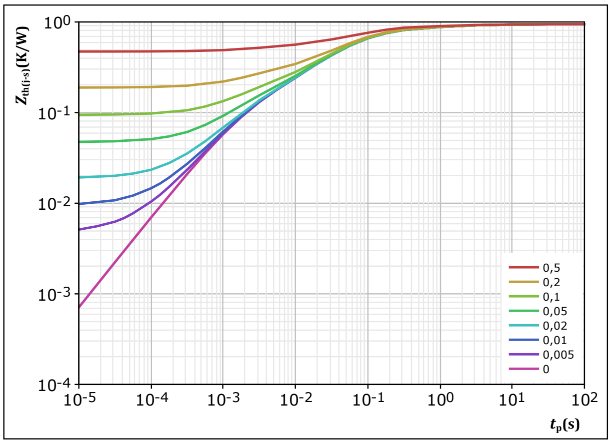
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 16.	Rectifier

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,943 K/W

Rectifier thermal model values

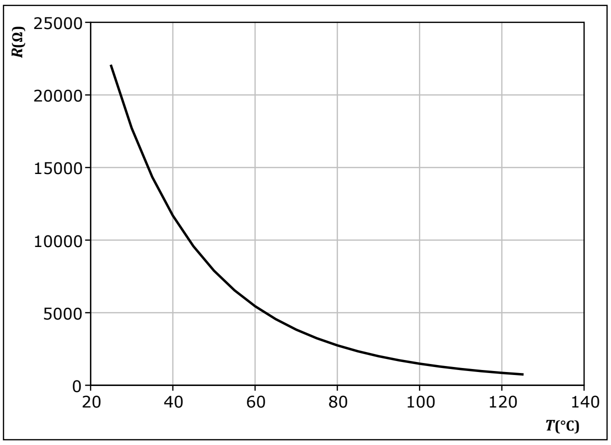
R (K/W)	τ (s)
4,37E-02	4,99E+00
1,29E-01	6,40E-01
4,96E-01	7,40E-02
1,86E-01	1,52E-02
8,87E-02	1,71E-03

Thermistor Characteristics

figure 17.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

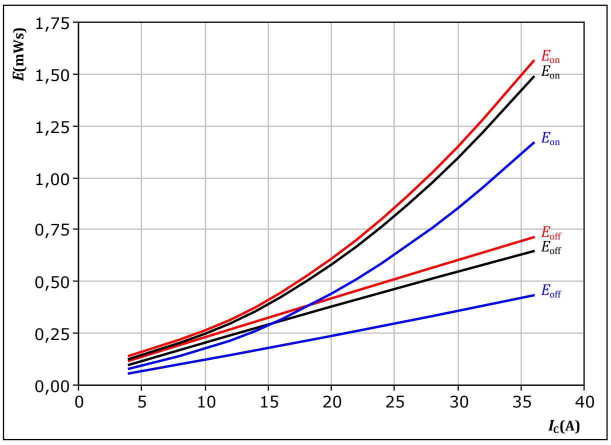


Inverter Switching Characteristics

figure 18. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

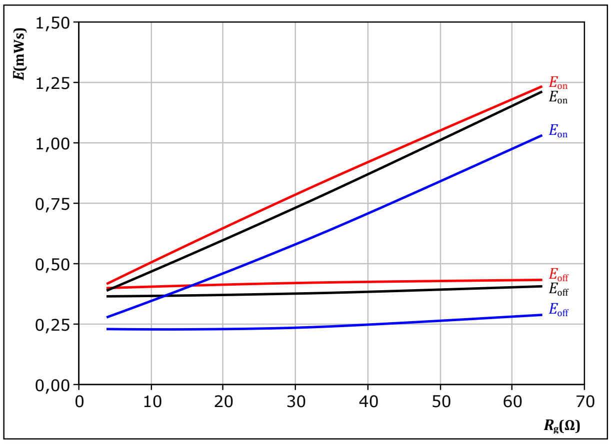
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 16 Ω
R_{goff} = 16 Ω

T_j: 25 °C / 125 °C / 150 °C

figure 19. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



With an inductive load at

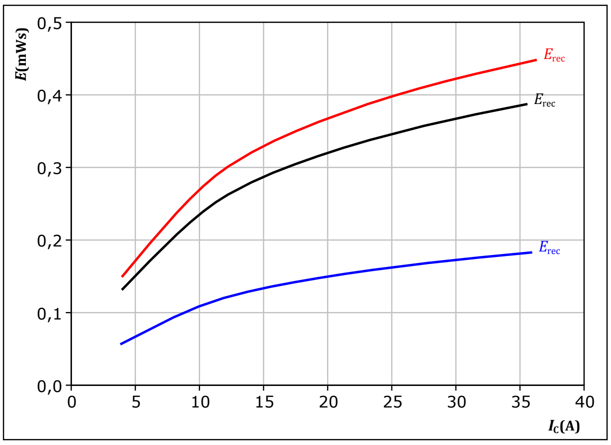
V_{CE} = 350 V
V_{GE} = ±15 V
I_C = 20 A

T_j: 25 °C / 125 °C / 150 °C

figure 20. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

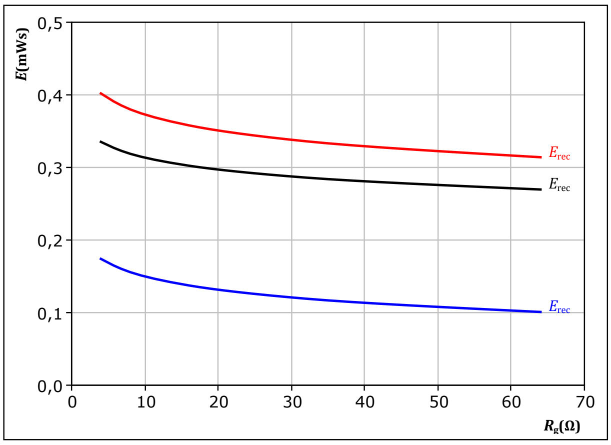
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 16 Ω

T_j: 25 °C / 125 °C / 150 °C

figure 21. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

V_{CE} = 350 V
V_{GE} = ±15 V
I_C = 20 A

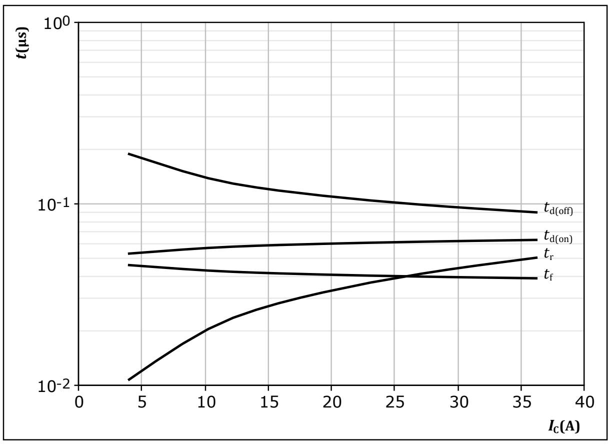
T_j: 25 °C / 125 °C / 150 °C

Inverter Switching Characteristics

figure 22. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



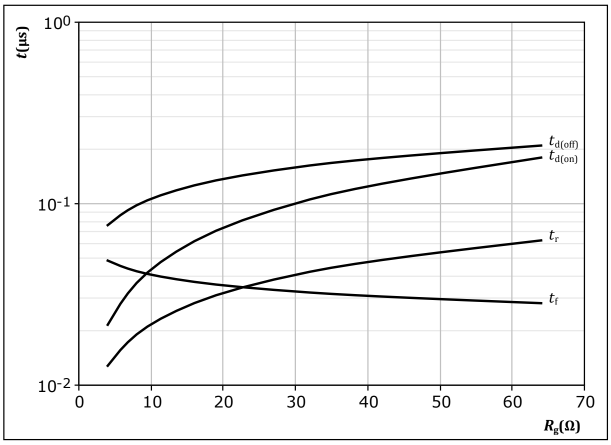
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 23. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



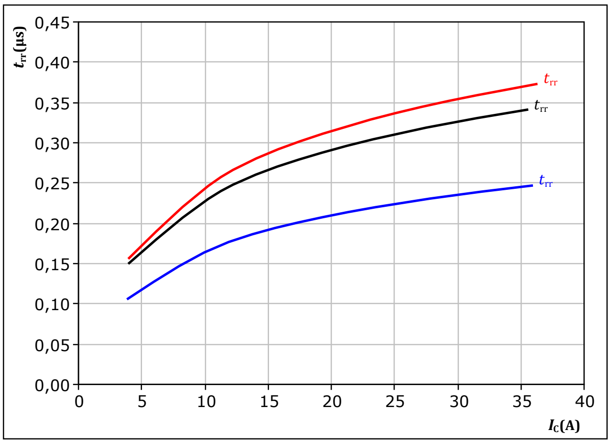
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	20	A

figure 24. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

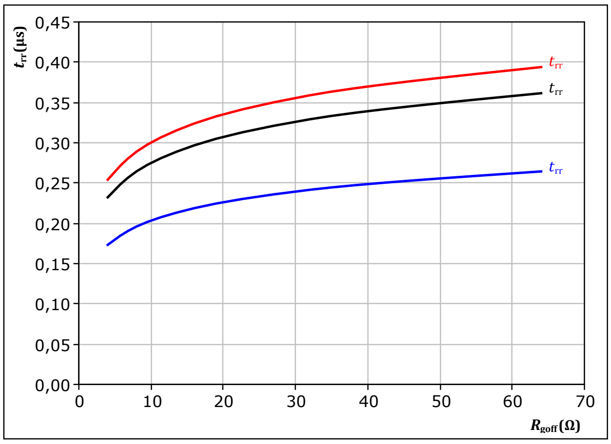
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 25. **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} =	350	V
V_{GE} =	±15	V
I_C =	20	A

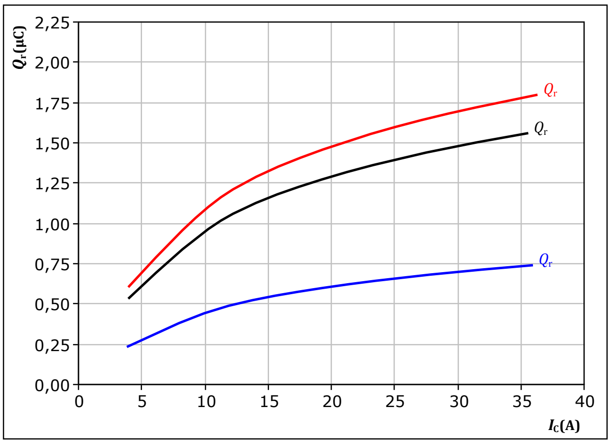
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 26. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



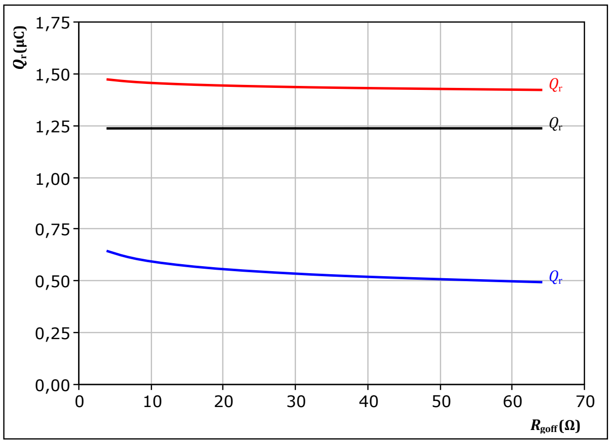
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	16	Ω		150 °C

figure 27. **FWD**

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



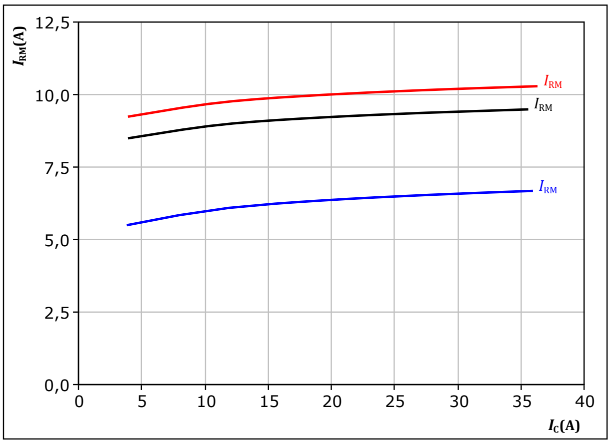
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	20	A		150 °C

figure 28. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



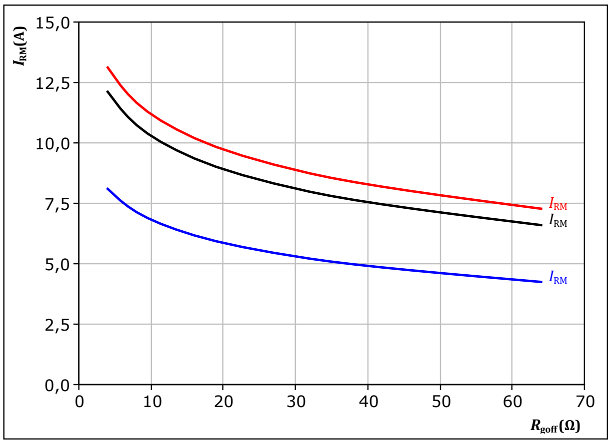
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	16	Ω		150 °C

figure 29. **FWD**

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

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



With an inductive load at

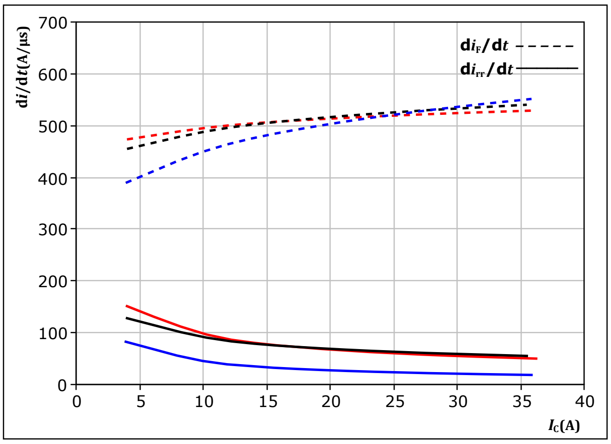
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	20	A		150 °C

Inverter Switching Characteristics

figure 30. 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

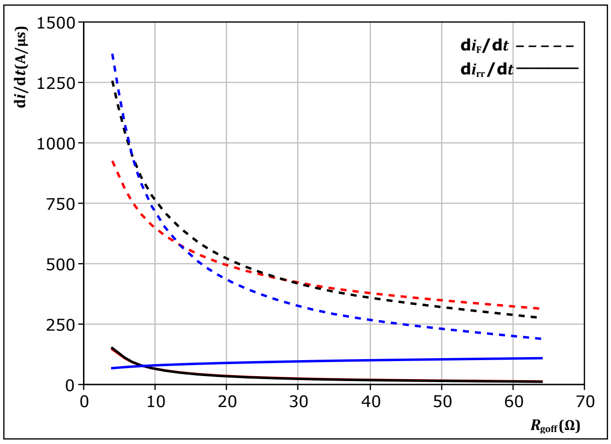
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	16	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 31. 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

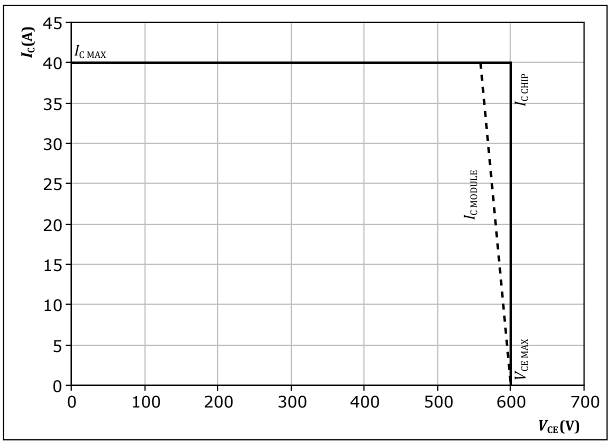
V_{CE} =	350	V	
V_{GE} =	±15	V	
I_C =	20	A	

T_j: 25 °C, 125 °C, 150 °C

figure 32. IGBT

Reverse bias safe operating area

I_C = f(V_{CE})



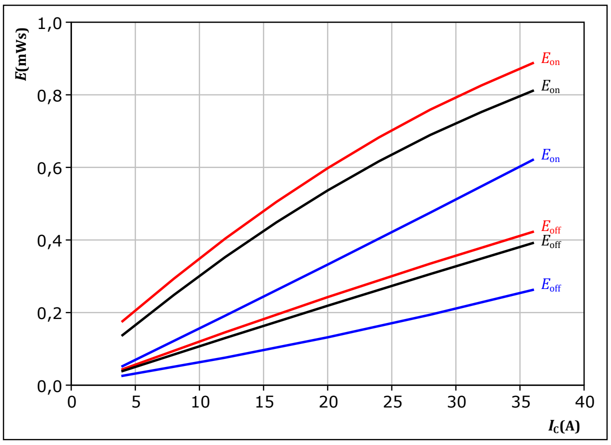
At	T_j =	150	°C
	R_{gon} =	16	Ω
	R_{goff} =	16	Ω

PFC Switching Characteristics

figure 33. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



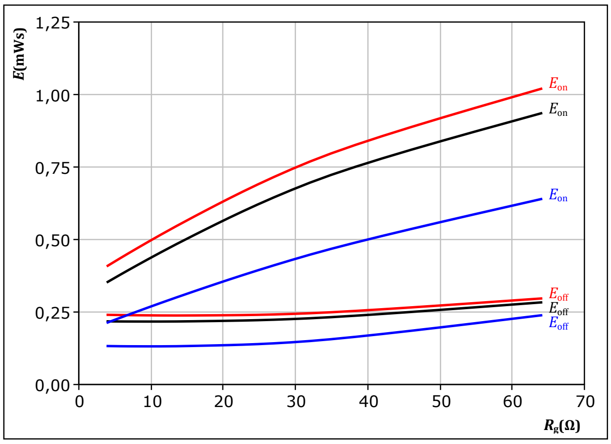
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	16	Ω		150 °C
R_{goff} =	16	Ω		

figure 34. **IGBT**

Typical switching energy losses as a function of gate resistor

E = f(R_g)



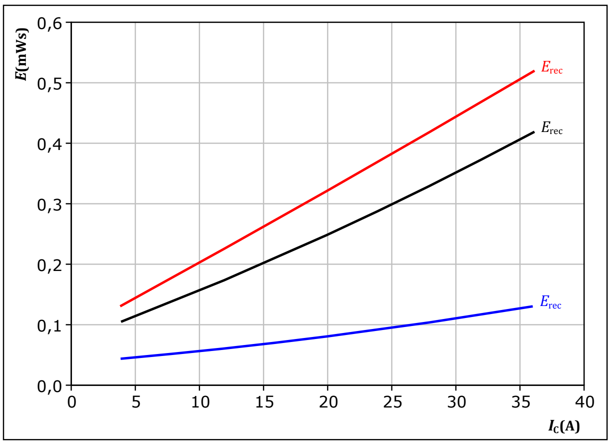
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	20	A		150 °C

figure 35. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



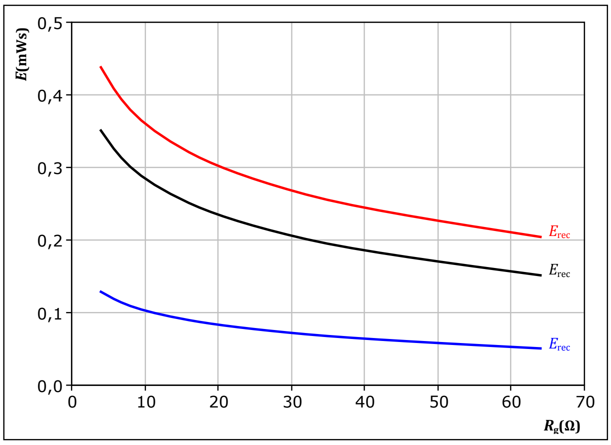
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	16	Ω		150 °C

figure 36. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

E_{rec} = f(R_g)



With an inductive load at

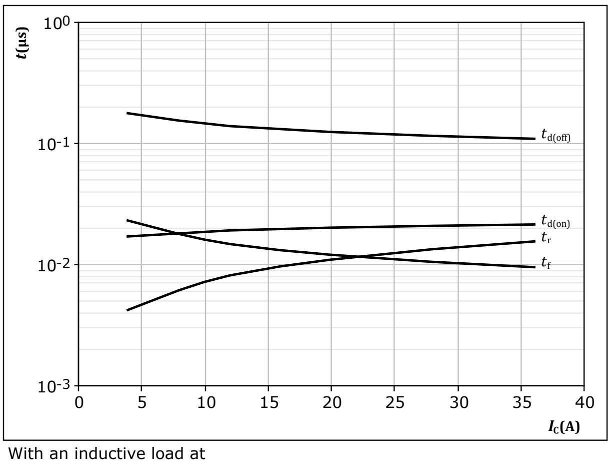
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	20	A		150 °C

PFC Switching Characteristics

figure 37. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



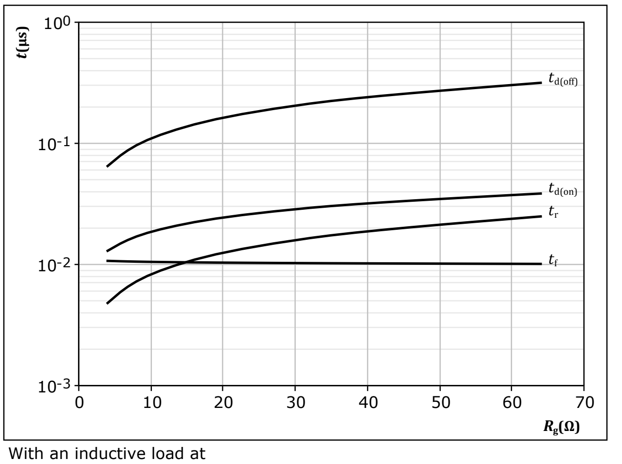
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 38. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



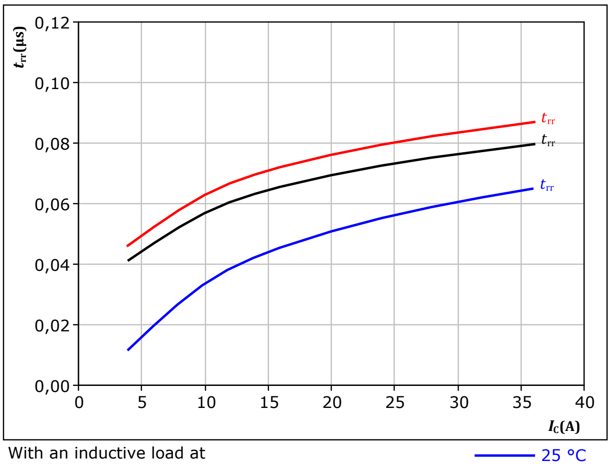
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	20	A

figure 39. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

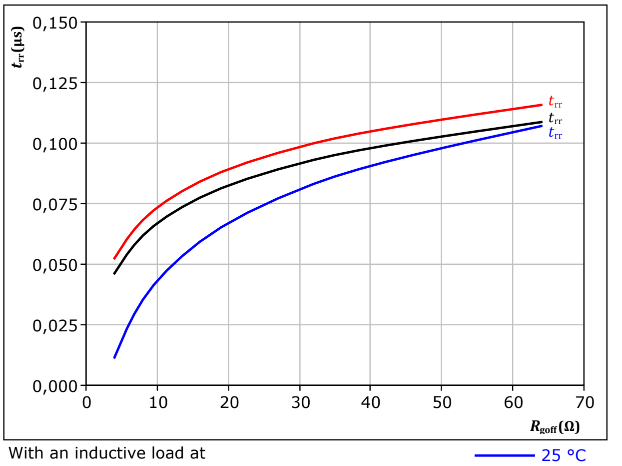
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	16	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 40. **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} =	0/15	V
I_C =	20	A

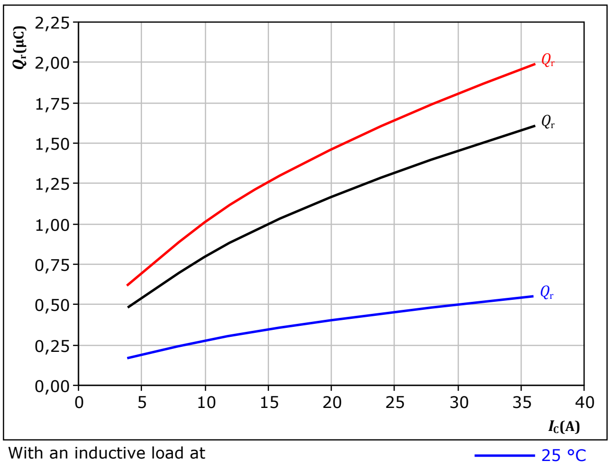
T_j: 25 °C, 125 °C, 150 °C

PFC Switching Characteristics

figure 41. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



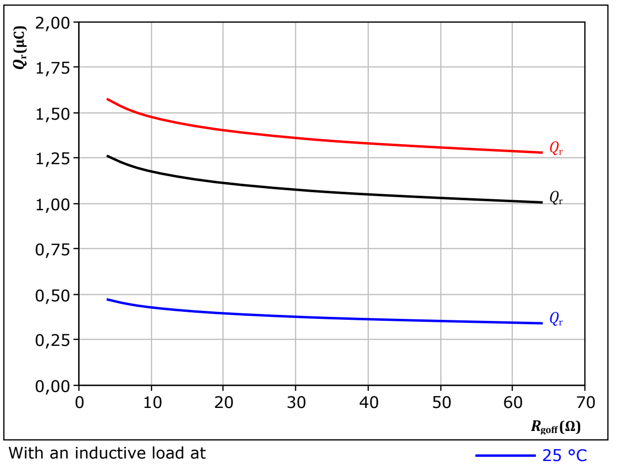
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	0/15	V	
R_{gon} =	16	Ω	

figure 42. FWD

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



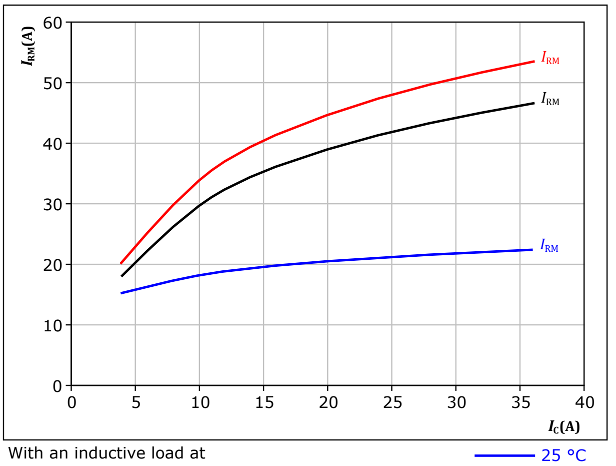
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	0/15	V	
I_C =	20	A	

figure 43. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



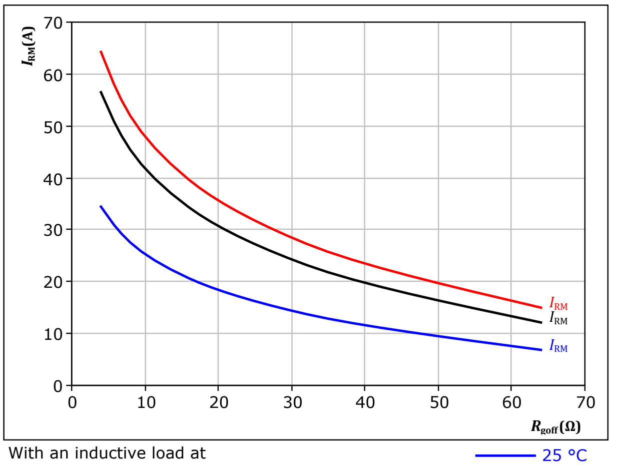
With an inductive load at

V_{CE} =	400	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	0/15	V	
R_{gon} =	16	Ω	

figure 44. FWD

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

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



With an inductive load at

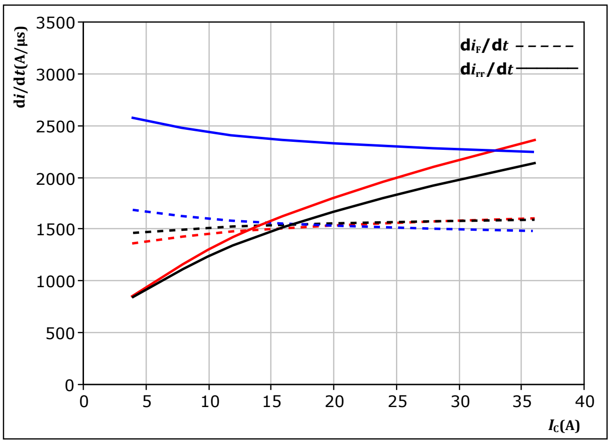
V_{CE} =	400	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	0/15	V	
I_C =	20	A	

PFC Switching Characteristics

figure 45. **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)



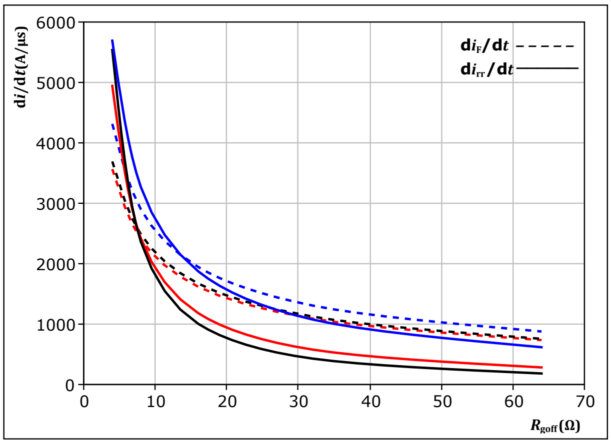
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	16	Ω		150 °C

figure 46. **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})



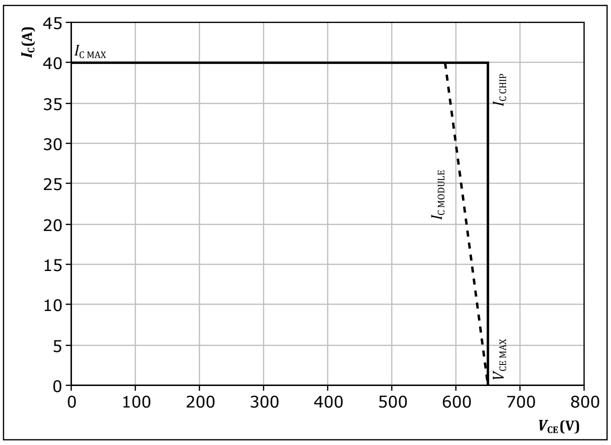
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	20	A		150 °C

figure 47. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At	T_j =	150	°C
	R_{gon} =	16	Ω
	R_{goff} =	16	Ω

Switching Definitions

figure 48. **IGBT**

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

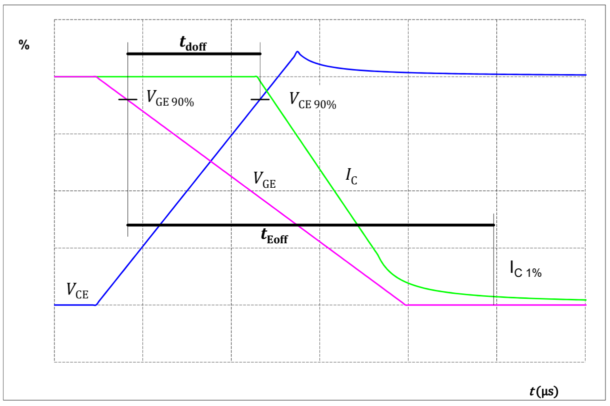


figure 49. **IGBT**

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

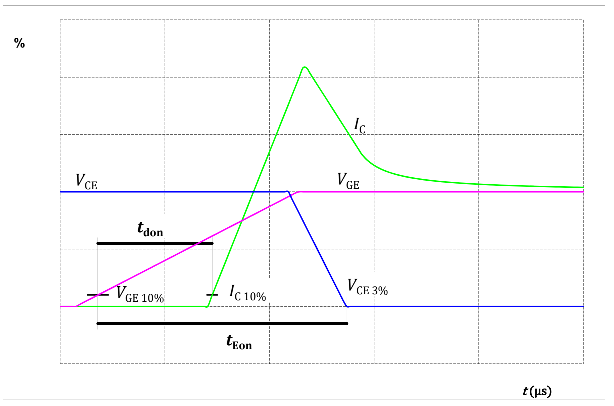


figure 50. **IGBT**

Turn-off Switching Waveforms & definition of t_f

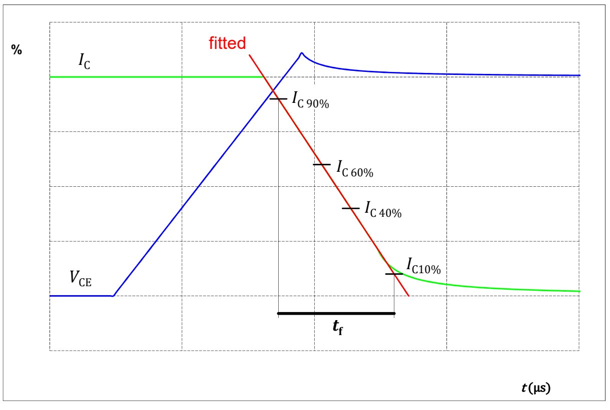
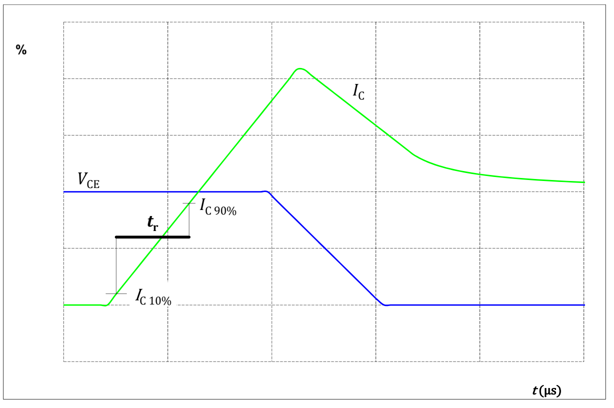


figure 51. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 52. **FWD**

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

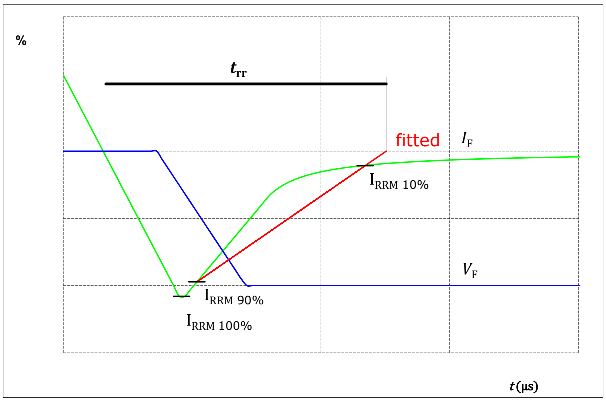
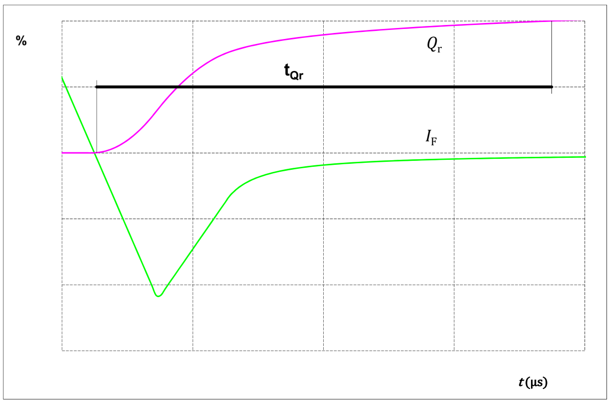


figure 53. **FWD**

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



Ordering Code

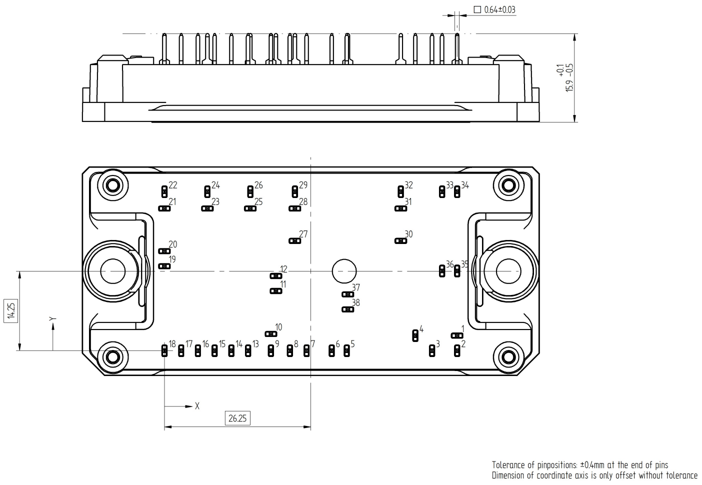
Version	Ordering Code
Without thermal paste	10-FE06PPA020SJ01-LK23B58Z
With thermal paste (5,2 W/mK, PTM6000HV)	10-FE06PPA020SJ01-LK23B58Z-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FE06PPA020SJ01-LK23B58Z-/3/

Marking

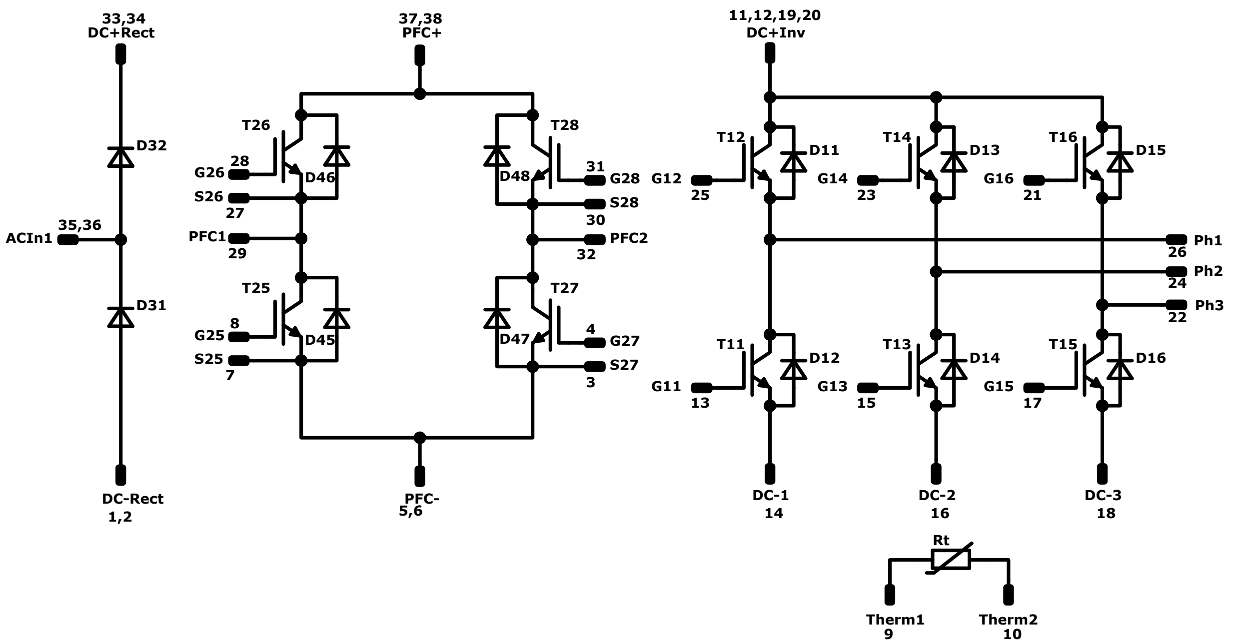
	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
		TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	52,5	2,7	DC-Rect
2	52,5	0	DC-Rect
3	48	0	S27
4	45	2,7	G27
5	32,7	0	PFC-
6	30	0	PFC-
7	25,5	0	S25
8	22,5	0	G25
9	19,1	0	Therm1
10	19,1	3	Therm2
11	20	10,7	DC+Inv
12	20	13,4	DC+Inv
13	15	0	G11
14	12	0	DC-1
15	9	0	G13
16	6	0	DC-2
17	3	0	G15
18	0	0	DC-3
19	0	15,15	DC+Inv
20	0	17,85	DC+Inv
21	0	25,5	G16
22	0	28,5	Ph3
23	7,7	25,5	G14
24	7,7	28,5	Ph2
25	15,4	25,5	G12
26	15,4	28,5	Ph1
27	23,4	19,7	S26
28	23,4	25,5	G26
29	23,4	28,5	PFC1
30	42,4	19,7	S28
31	42,4	25,5	G28
32	42,4	28,5	PFC2
33	49,8	28,5	DC+Rect
34	52,5	28,5	DC+Rect
35	52,5	14,3	ACIn1
36	49,8	14,3	ACIn1
37	32,9	10,1	PFC+
38	32,9	7,4	PFC+



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	600 V	20 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	600 V	15 A	Inverter Diode	
T25, T26, T27, T28	IGBT	650 V	20 A	PFC Switch	
D46, D45, D48, D47	FWD	650 V	30 A	PFC Diode	
D31, D32	Rectifier	1600 V	35 A	Rectifier Diode	
Rt	Thermistor			Thermistor	NCP21XW223-J-03-RA (Murata)

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

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

Package data
Package data for *flow* 1 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-FE06PPA020SJ01-LK23B58Z-D2-14	26 Nov. 2021	Change Thermistor	