10-FE06PPA030SJ04-LJ02B03Z

datasheet

***flow*PIM 1 + PFC** **600 V / 30 A**

Topology features

- 3x Shunts
- Converter + 2-leg interleaved PFC + Inverter
- On-board Capacitors
- Open Emitter configuration
- Temperature sensor

Component features

- 5us short circuit withstand time
- High speed switching
- Low EMI
- Short tail current

Housing features

- Base isolation: Al_2O_3
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

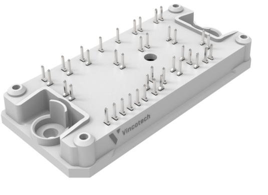
Target applications

- Embedded Drives
- Industrial Drives

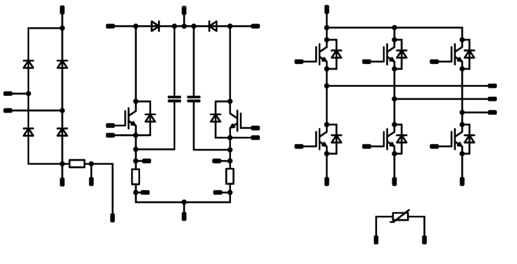
Types

- 10-FE06PPA030SJ04-LJ02B03Z

flow 1 12 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	30	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	63	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	28	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		40	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	50	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	29	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	68	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}			600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	46	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		60	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 25 °C	310	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	60	W
Maximum junction temperature	T_{jmax}			175	°C
PFC Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s <= 80 °C	12 (1)	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		12	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	38	W
Maximum junction temperature	T_{jmax}			175	°C

(1) limited by I_{FRM}

Parameter	Symbol	Conditions		Value	Unit
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	50	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	270	A
Surge current capability	I^2t			365	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	64	W
Maximum junction temperature	T_{jmax}			150	°C
PFC Shunt					
DC current	I			20	A
Power dissipation	P_{tot}		T_c = 70 °C	2	W
Operation Temperature	T_{op}			-65 ... 170	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Shunt					
DC current	I			20	A
Power dissipation	P_{tot}		T_c = 70 °C	2	W
Operation Temperature	T_{op}			-65 ... 170	°C
Capacitor (PFC)					
Maximum DC voltage	V_{MAX}			630	V
Operation Temperature	T_{op}			-55 ... 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				12,7	mm
Clearance				8,18	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]	Values Min	Typ	Max	Unit
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00048	25	4,1	5,1	5,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		30	25 125 150		1,73 1,97 2,01	1,8(2)	V
Collector-emitter cut-off current	I_{CES}		0	600		25			1,6	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		1050		pF
Output capacitance	C_{oes}							45		pF
Reverse transfer capacitance	C_{res}							36		pF
Gate charge	Q_g	V_{CC} = 480 V	15		30	25		130		nC
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,52		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	350	30	25 125 150		37 38 38		ns
Rise time	t_r					25 125 150		12 13 15		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		90 109 113		ns
Fall time	t_f					25 125 150		12 19,35 23,06		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,812 µC Q_{rFWD}=1,81 µC Q_{rFWD}=2,02 µC				25 125 150		0,758 0,981 1,04		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,233 0,422 0,469		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]	Values Min	Typ	Max	Unit
Inverter Diode										
Static										
Forward voltage	V_F				20	25 125 150	1,25	1,7 1,58 1,58	1,95[2]	V
Reverse leakage current	I_R	V_r = 600 V				25			27	µA
Thermal										
Thermal resistance junction to sink[3]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,91		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=500 A/µs d*i*/d*t*=1295 A/µs d*i*/d*t*=1294 A/µs	±15	350	30	25 125 150		7,86 12,39 13,22		A
Reverse recovery time	t_{rr}					25 125 150		200,95 276,23 327,76		ns
Recovered charge	Q_r					25 125 150		0,812 1,81 2,02		µC
Reverse recovered energy	E_{rec}					25 125 150		0,161 0,388 0,431		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		53,57 61,27 82,45		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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0003	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		30	25 125		1,97 2,25	2,22(2)	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		1800		pF
Output capacitance	C_{oes}							45		pF
Reverse transfer capacitance	C_{res}							9		pF
Gate charge	Q_g	V_{CC} = 520 V	15		30	25		65		nC
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,39		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	0/15	400	30	25 125 150		14,68 14,47 14,12		ns
Rise time	t_r					25 125 150		5,04 6,21 6,61		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		84,2 100,34 103,9		ns
Fall time	t_f					25 125 150		1,16 3,01 10,29		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,456 µC Q_{rFWD}=1,34 µC Q_{rFWD}=1,67 µC				25 125 150		0,295 0,461 0,523		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,153 0,241 0,266		mWs

Vincotech

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		1,67 1,33 1,24	2,5(2)	V
Reverse leakage current	I_R	V_r = 600 V				25			20	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,58		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=4277 A/µs di/dt=4179 A/µs di/dt=4332 A/µs	0/15	400	30	25 125 150		47,04 74,4 84,02		A
Reverse recovery time	t_{rr}					25 125 150		19,1 37,01 40,23		ns
Recovered charge	Q_r					25 125 150		0,456 1,34 1,67		µC
Reverse recovered energy	E_{rec}					25 125 150		0,079 0,284 0,364		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		6342,52 5926,83 5963,38		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 Sw. Protection Diode										
Static										
Forward voltage	V_F				6	25 125 150	1,23	1,72 1,58 1,54	1,87(2)	V
Reverse leakage current	I_R	V_r = 650 V				25			0,1	μA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,53		K/W
Rectifier Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,27 1,27	1,3(2) 1,37(2)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			20 1500	μA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,1		K/W
PFC Shunt										
Static										
Resistance	R							5		mΩ
Tolerance							-1		1	%
Temperature coeficient	tc							110		ppm/K

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
Shunt										
Static										
Resistance	R							5		mΩ
Tolerance							-1		1	%
Temperature coeficient	tc							110		ppm/K
Capacitor (PFC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		33		nF
Tolerance							-5		5	%
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	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	

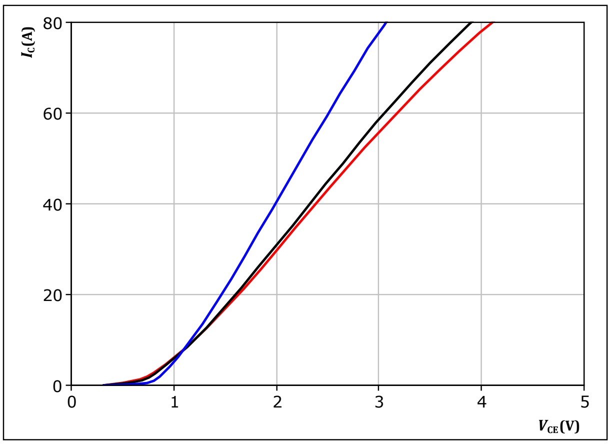
(2) Value at chip level
(3) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

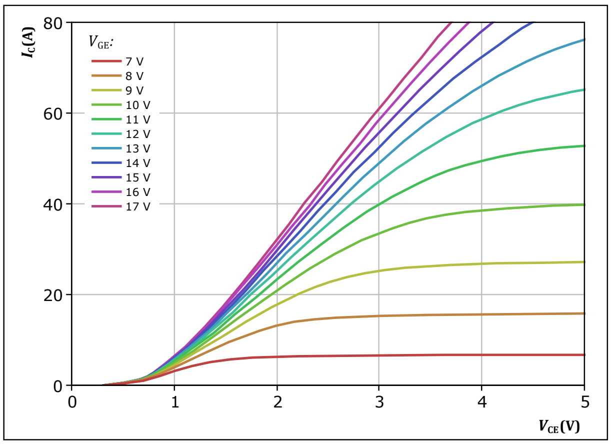


t_p =	250	μs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



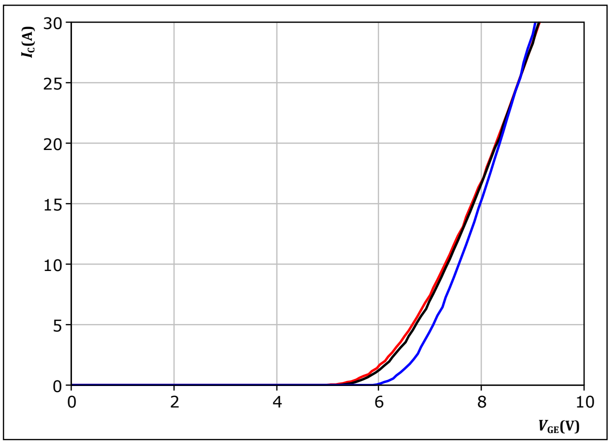
t_p =	250	μs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

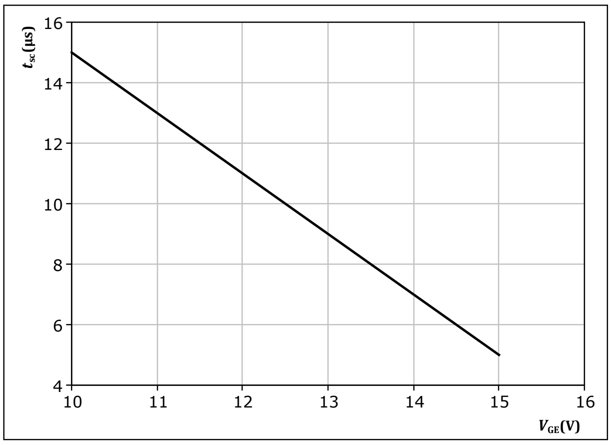


t_p =	250	μs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

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

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



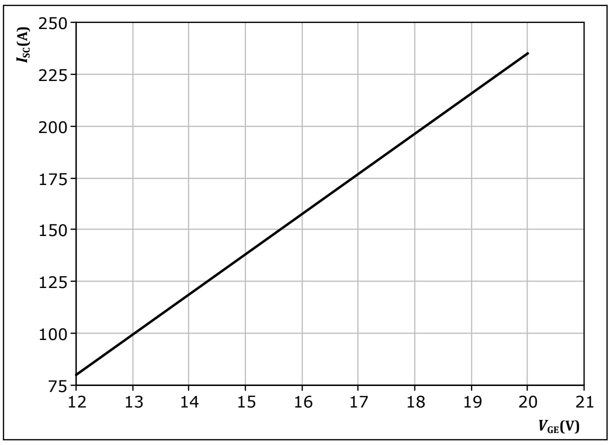
At	V_{CE} =	400	V
	T_j ≤	150	°C

Inverter Switch Characteristics

figure 5. **IGBT**

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

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

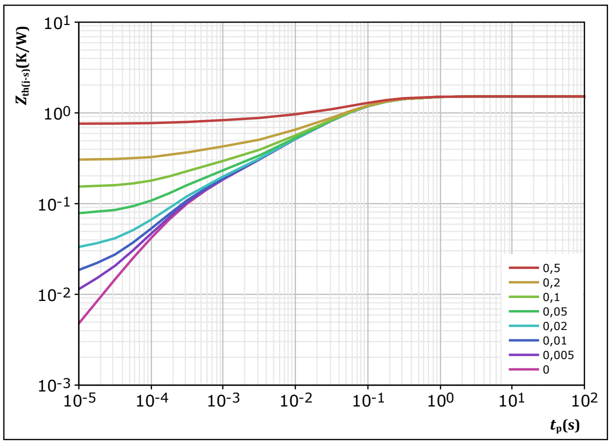


At	V_{CE} =	400	V
	T_j ≤	150	°C

figure 6. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,52	K/W

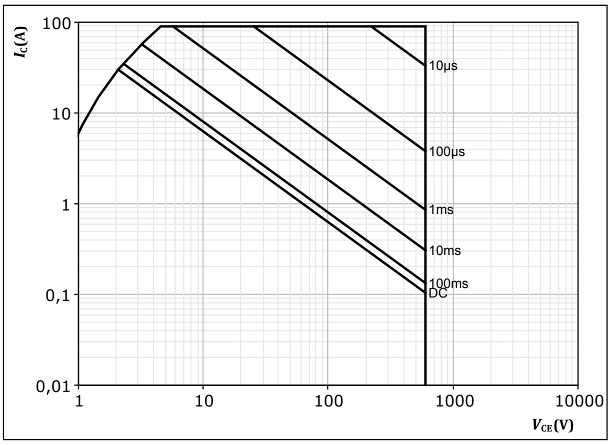
IGBT thermal model values

R (K/W)	τ (s)
1,77E-01	4,26E-01
6,88E-01	7,72E-02
3,07E-01	2,26E-02
2,02E-01	5,04E-03
6,94E-02	7,36E-04
7,56E-02	2,30E-04

figure 7. **IGBT**

Safe operating area

I_C = f(V_{CE})

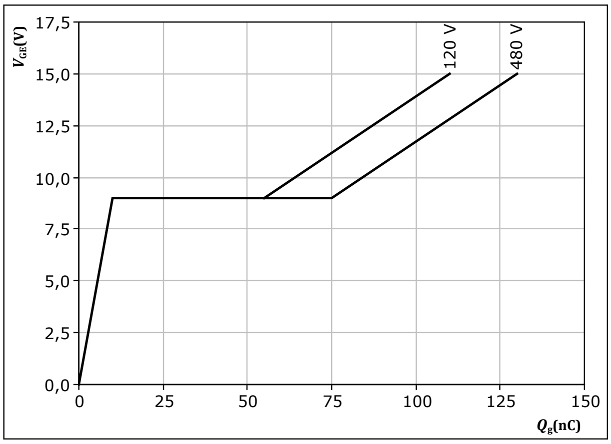


D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 8. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



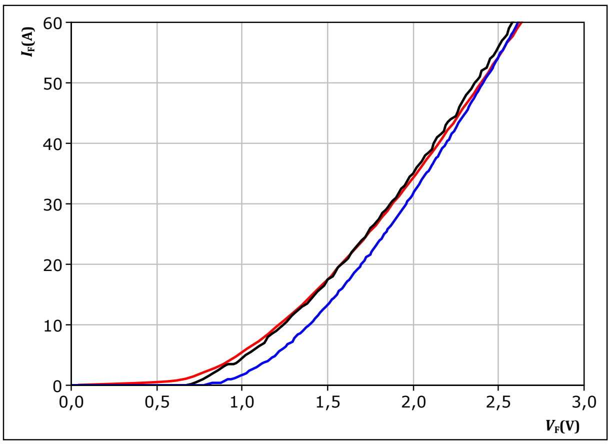
I_C =	30	A
T_j =	25	°C

Inverter Diode Characteristics

figure 9. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



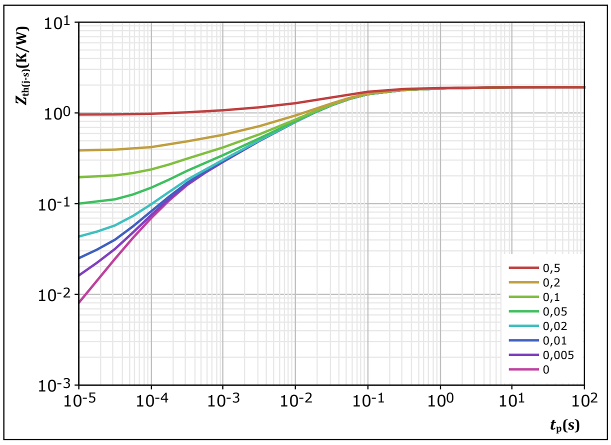
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 10. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,914 K/W

FWD thermal model values

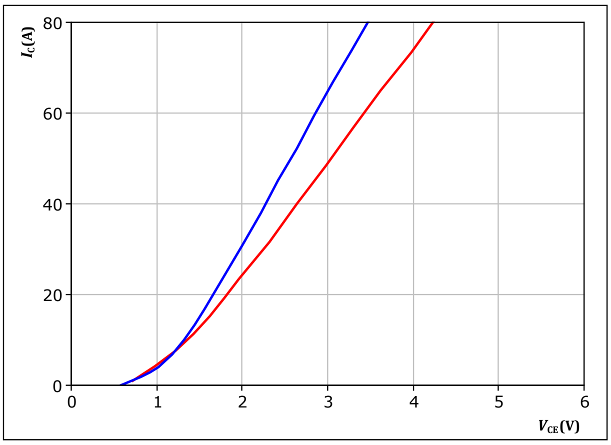
R (K/W)	τ (s)
8,07E-02	2,21E+00
2,18E-01	2,22E-01
8,50E-01	4,41E-02
4,32E-01	9,35E-03
2,00E-01	1,60E-03
1,34E-01	2,12E-04

PFC Switch Characteristics

figure 11. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

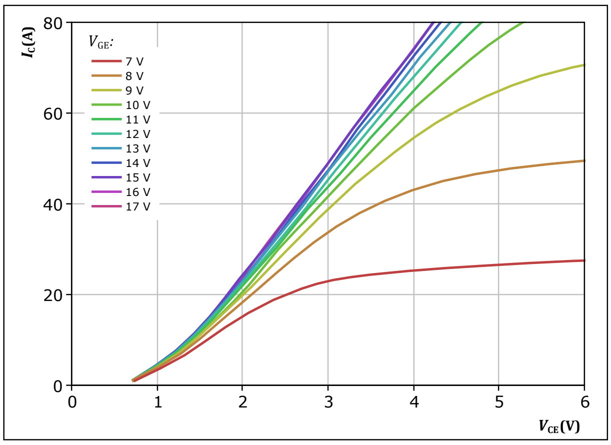


t_p =	250	μs	T_j:	25 °C
V_{GE} =	15	V		125 °C

figure 12. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



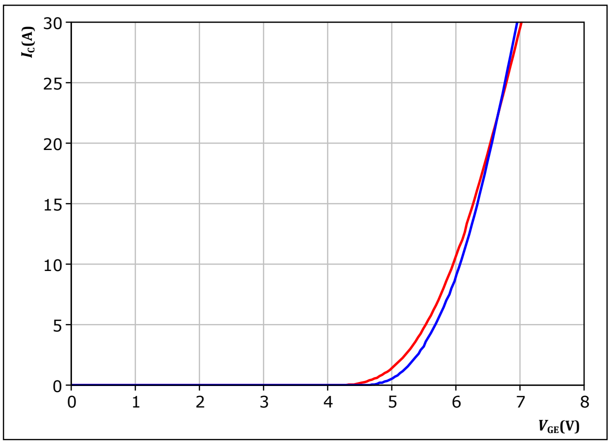
t_p =	250	μs
T_j =	125	°C

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

figure 13. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

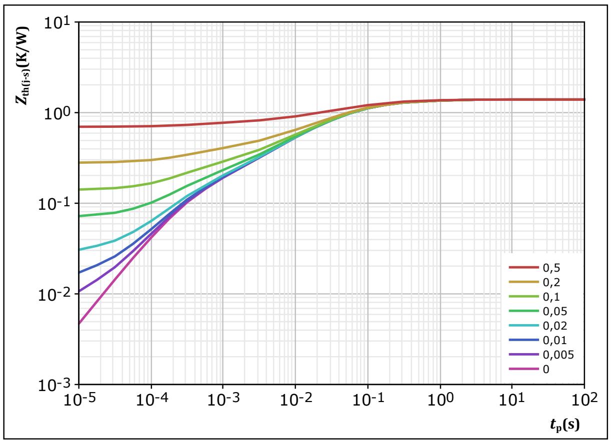


t_p =	250	μs	T_j:	25 °C
V_{CE} =	10	V		125 °C

figure 14. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,394	K/W

IGBT thermal model values

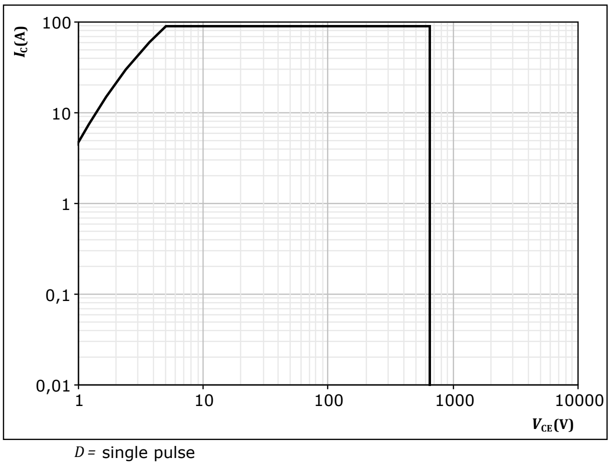
R (K/W)	τ (s)
8,66E-02	1,03E+00
1,95E-01	1,93E-01
5,59E-01	5,17E-02
3,47E-01	9,99E-03
9,37E-02	1,86E-03
1,12E-01	2,95E-04

PFC Switch Characteristics

figure 15. **IGBT**

Safe operating area

I_C = f(V_{CE})

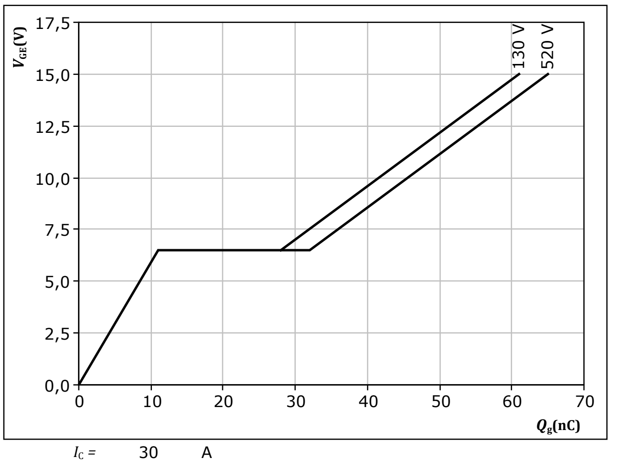


D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 16. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



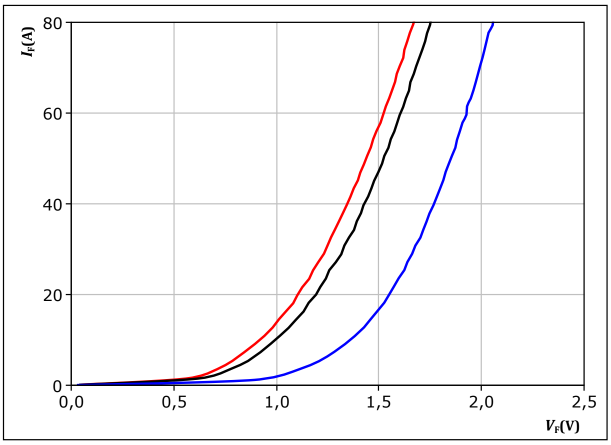
I_C =	30	A
T_j =	25	°C

PFC Diode Characteristics

figure 17. **FWD**

Typical forward characteristics

I_F = f(V_F)



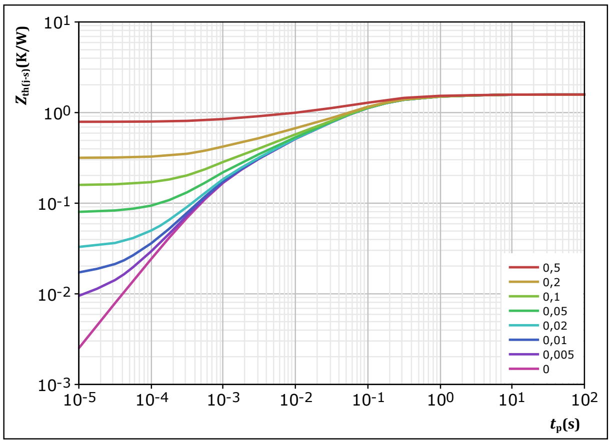
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 18. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,581 K/W

FWD thermal model values

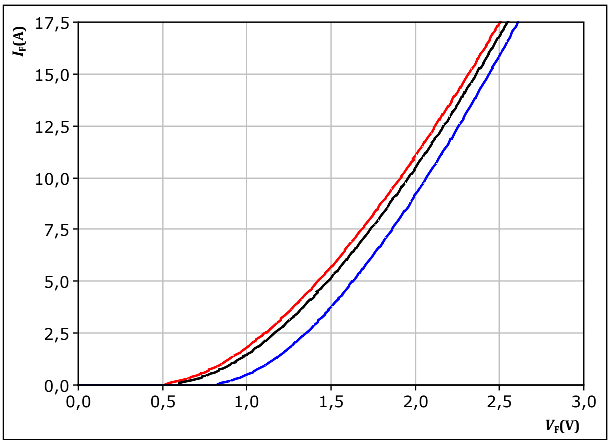
R (K/W)	τ (s)
9,48E-02	2,80E+00
2,89E-01	3,14E-01
7,00E-01	6,69E-02
3,27E-01	7,77E-03
1,71E-01	8,57E-04

PFC Sw. Protection Diode Characteristics

figure 19. FWD

Typical forward characteristics

$I_F = f(V_F)$



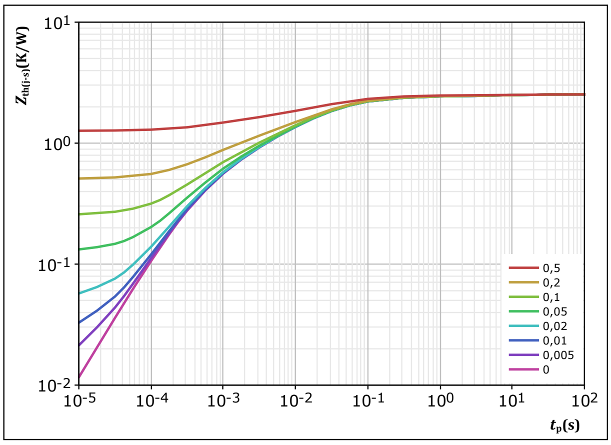
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 20. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 2,527 K/W

FWD thermal model values

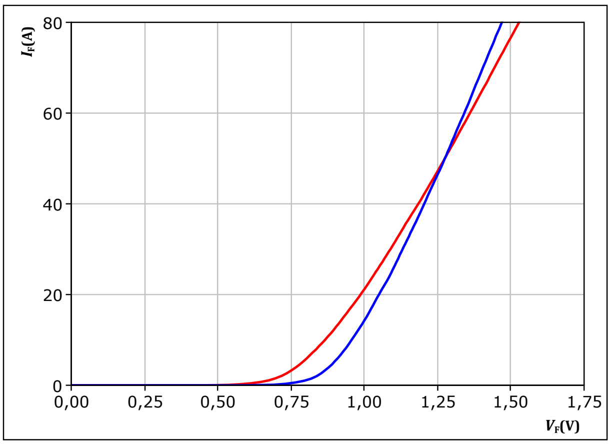
R (K/W)	τ (s)
9,24E-02	9,29E+00
1,75E-01	3,21E-01
7,31E-01	4,97E-02
7,14E-01	1,16E-02
4,89E-01	2,11E-03
3,27E-01	3,78E-04

Rectifier Diode Characteristics

figure 21. **Rectifier**

Typical forward characteristics

I_F = f(V_F)



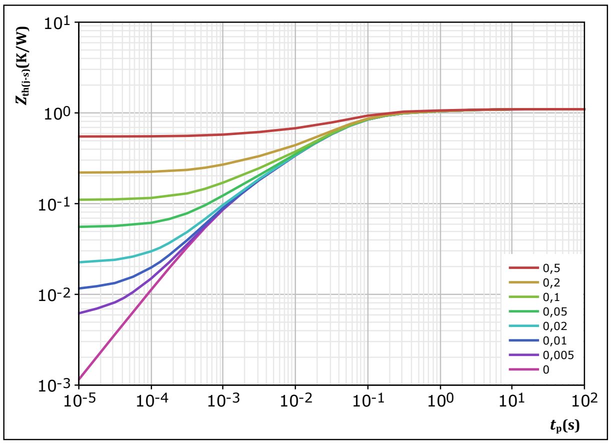
t_p = 250 μs

T_j: 25 °C, 125 °C

figure 22. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,098 K/W

Rectifier thermal model values

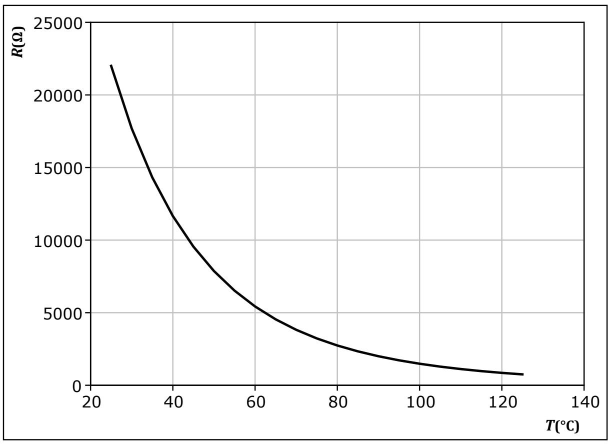
R (K/W)	τ (s)
4,35E-02	3,78E+00
9,34E-02	6,17E-01
3,79E-01	8,75E-02
3,82E-01	2,72E-02
1,24E-01	5,56E-03
7,66E-02	1,02E-03

Thermistor Characteristics

figure 23.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

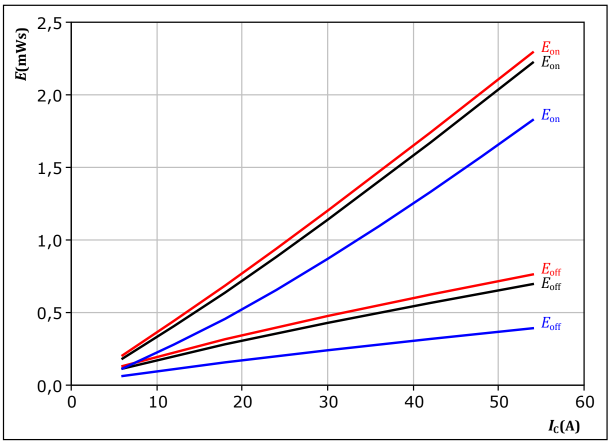


Inverter Switching Characteristics

figure 24. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



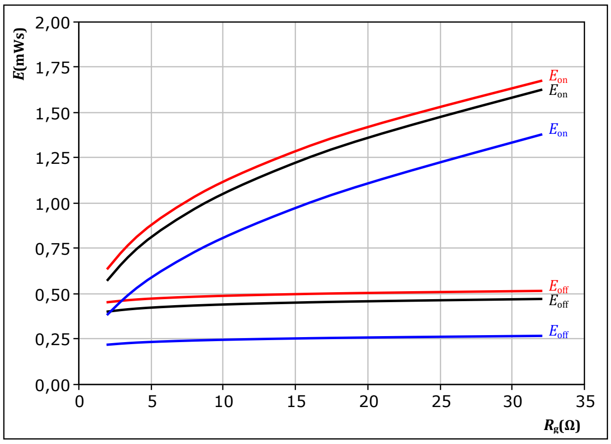
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
R_{gon} =	8	Ω	
R_{goff} =	8	Ω	

figure 25. **IGBT**

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

$E = f(R_g)$



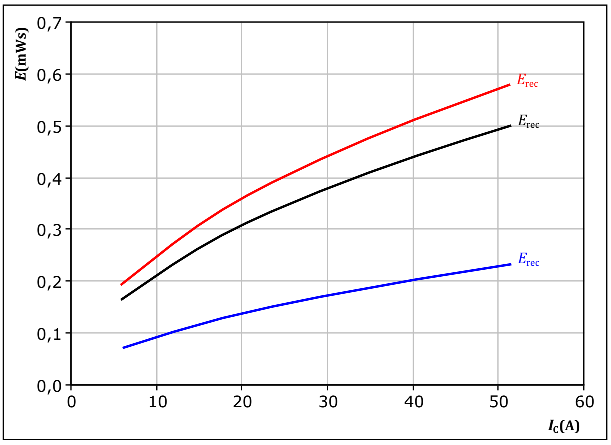
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	30	A	

figure 26. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



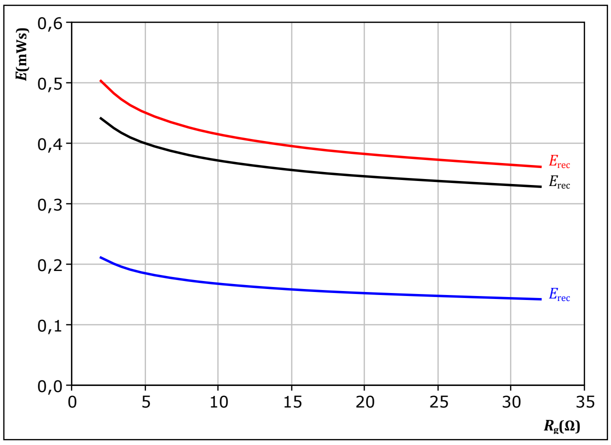
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
R_{gon} =	8	Ω	

figure 27. **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

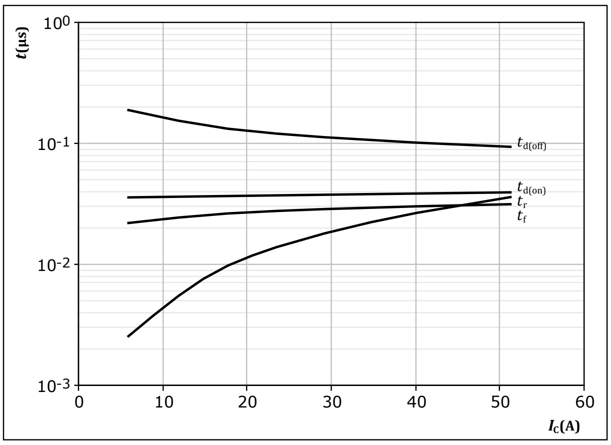
V_{CE} =	350	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	30	A	

Inverter Switching Characteristics

figure 28. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



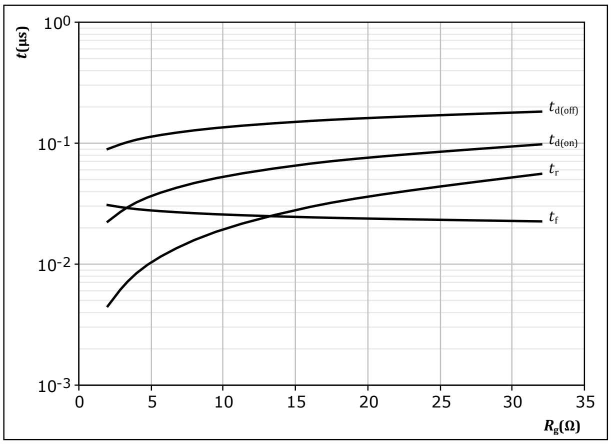
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 29. **IGBT**

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

t = f(R_g)



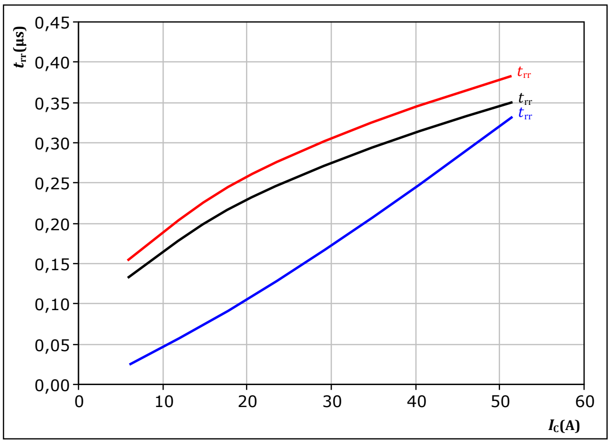
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	30	A

figure 30. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

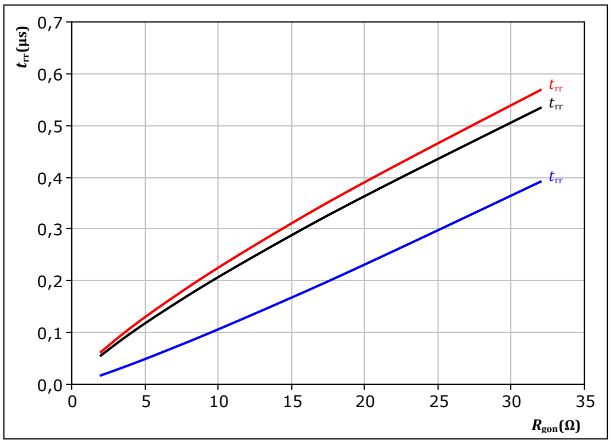
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 31. **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} =	350	V
V_{GE} =	±15	V
I_C =	30	A

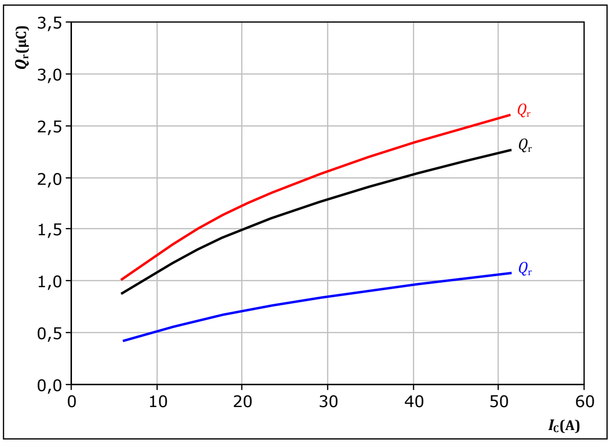
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 32. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



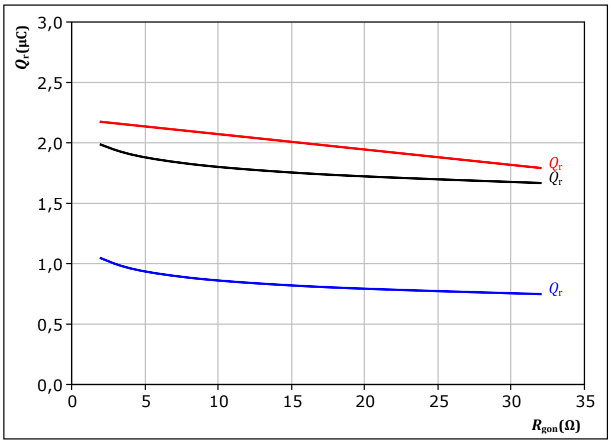
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 33. **FWD**

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

Q_r = f(R_{gon})



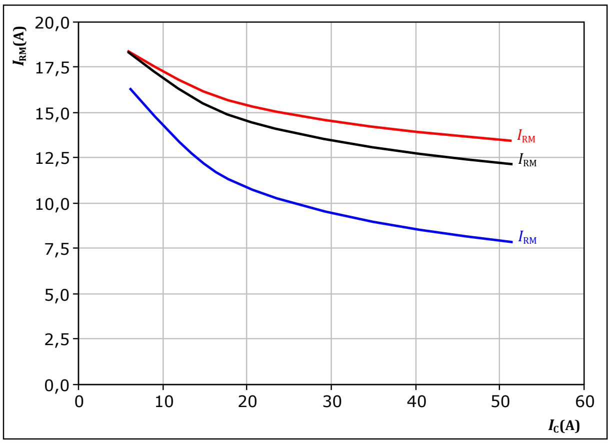
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	30	A		150 °C

figure 34. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



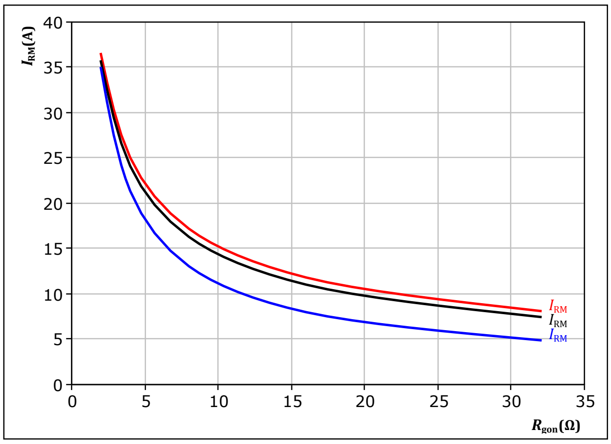
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 35. **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

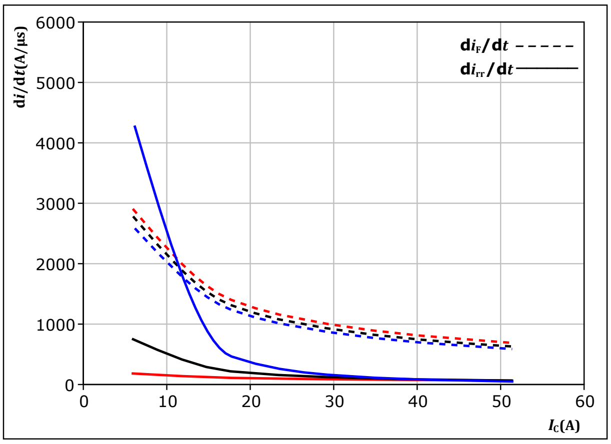
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	30	A		150 °C

Inverter Switching Characteristics

figure 36. **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)



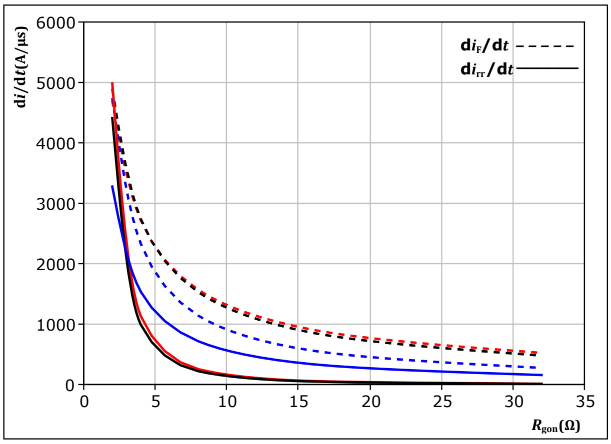
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 37. **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})



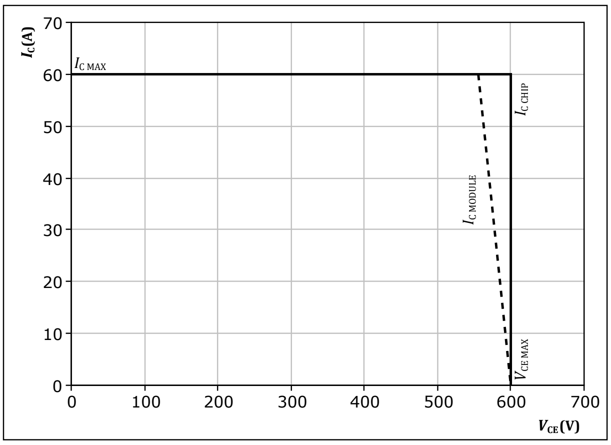
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	30	A		150 °C

figure 38. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



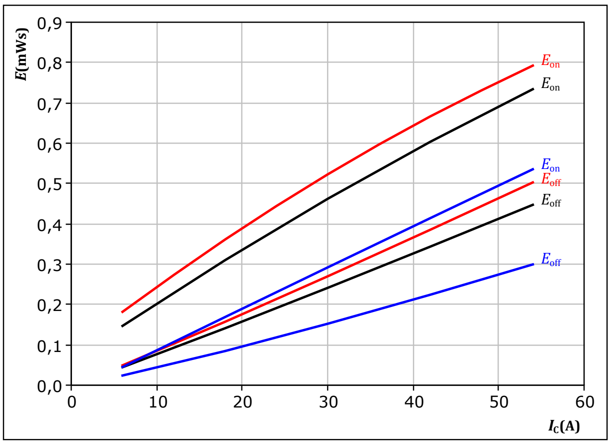
At	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

PFC Switching Characteristics

figure 39. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



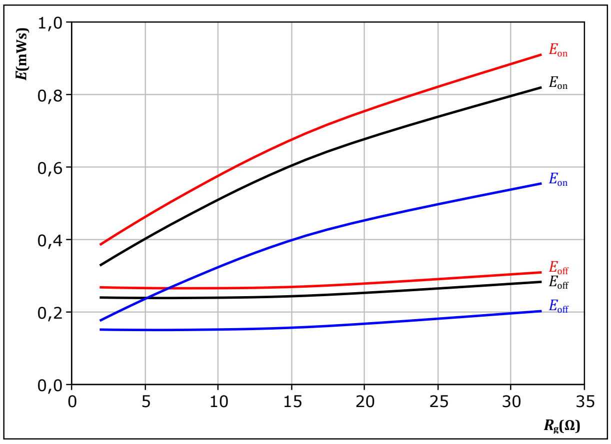
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	8	Ω		150 °C
R_{goff} =	8	Ω		

figure 40. **IGBT**

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

$E = f(R_g)$



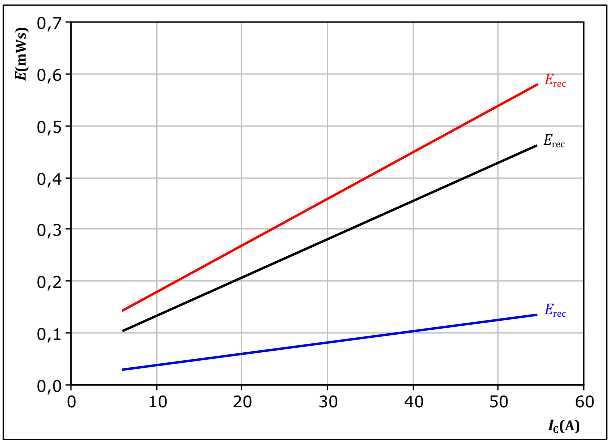
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	30	A		150 °C

figure 41. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



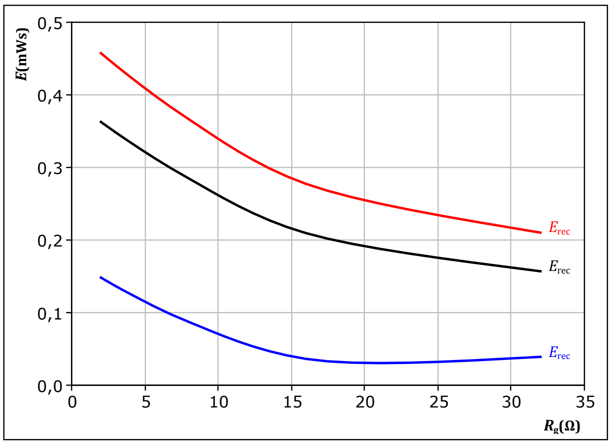
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 42. **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

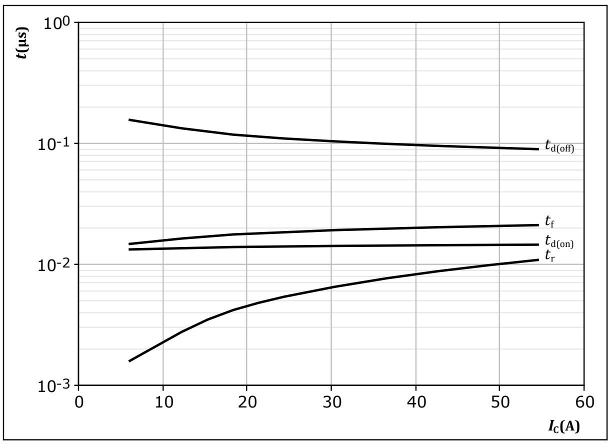
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	30	A		150 °C

PFC Switching Characteristics

figure 43. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



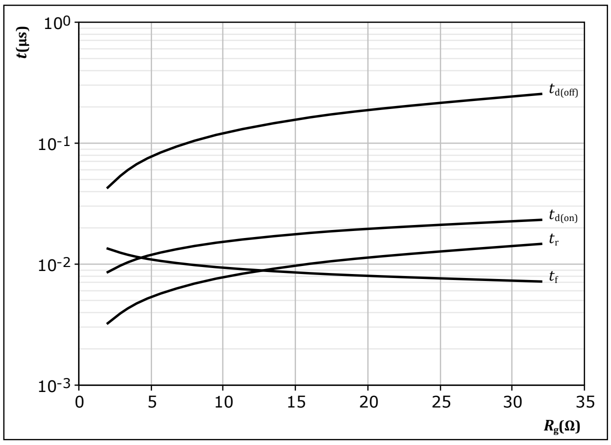
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 44. **IGBT**

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

$t = f(R_g)$



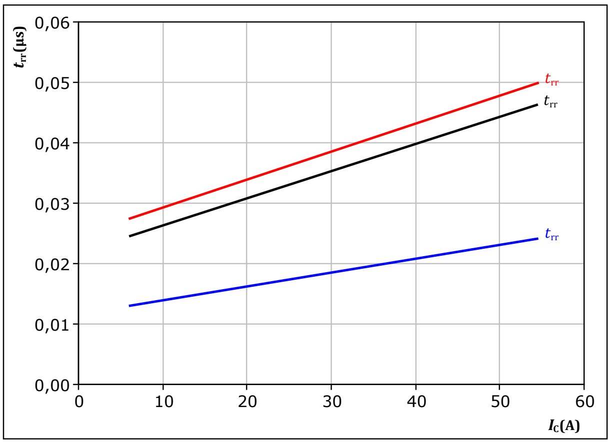
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0/15	V
I_C =	30	A

figure 45. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

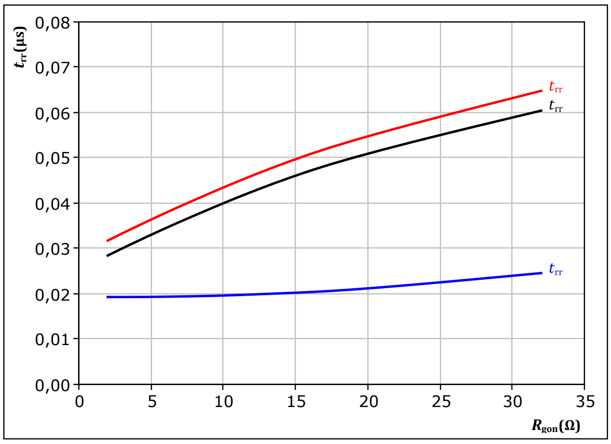
V_{CE} =	400	V
V_{GE} =	0/15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 46. **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} =	0/15	V
I_C =	30	A

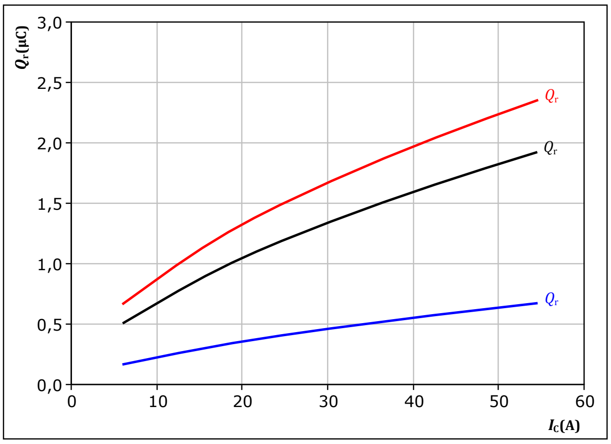
T_j: 25 °C, 125 °C, 150 °C

PFC Switching Characteristics

figure 47. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



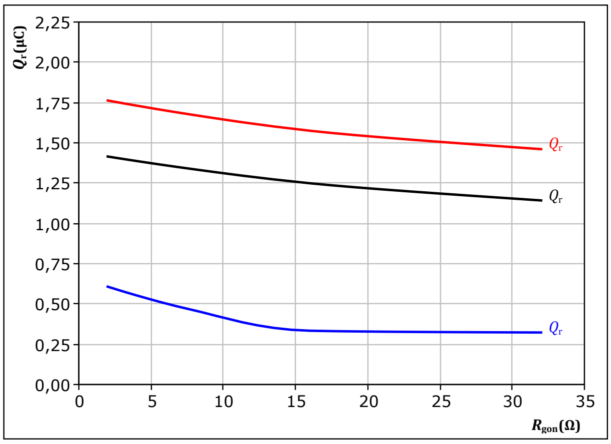
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 48. FWD

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

Q_r = f(R_{gon})



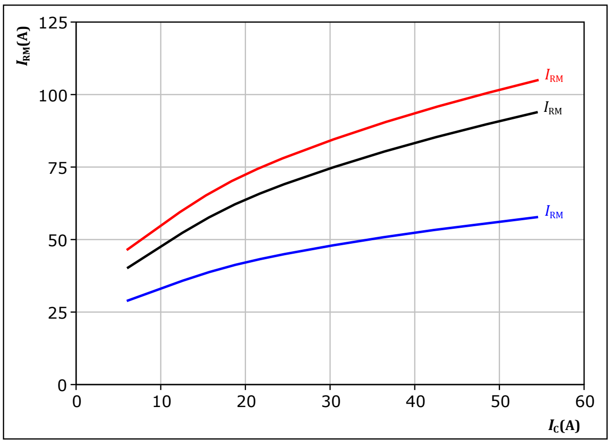
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	30	A		150 °C

figure 49. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



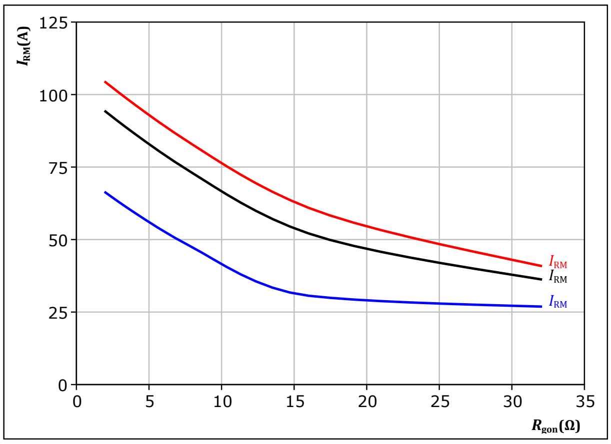
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 50. 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

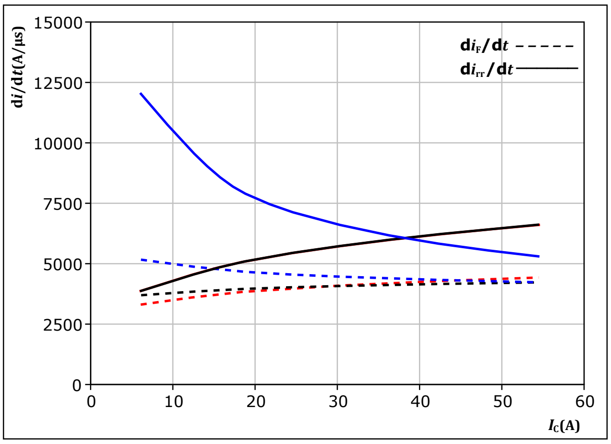
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	30	A		150 °C

PFC Switching Characteristics

figure 51. **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)



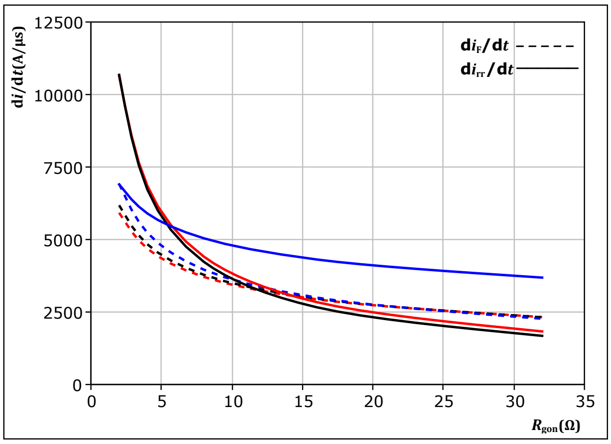
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 52. **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})



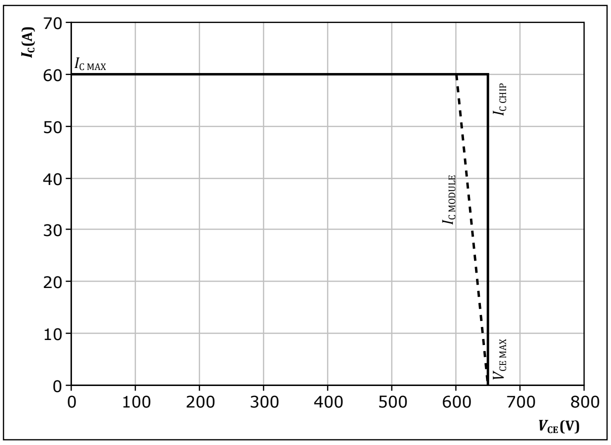
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	30	A		150 °C

figure 53. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

Switching Definitions

figure 54. **IGBT**

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

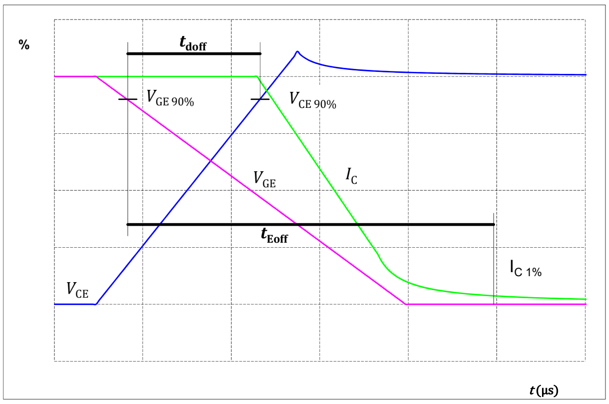


figure 55. **IGBT**

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

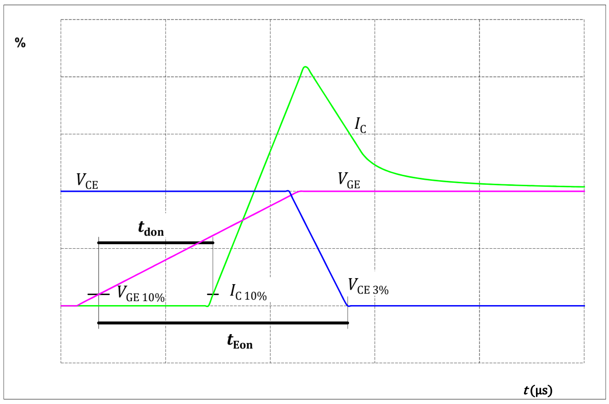


figure 56. **IGBT**

Turn-off Switching Waveforms & definition of t_f

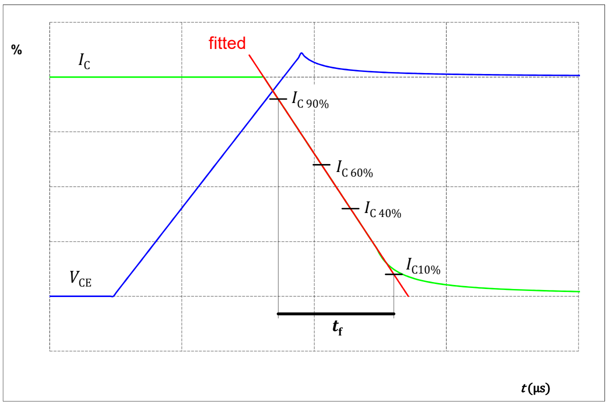
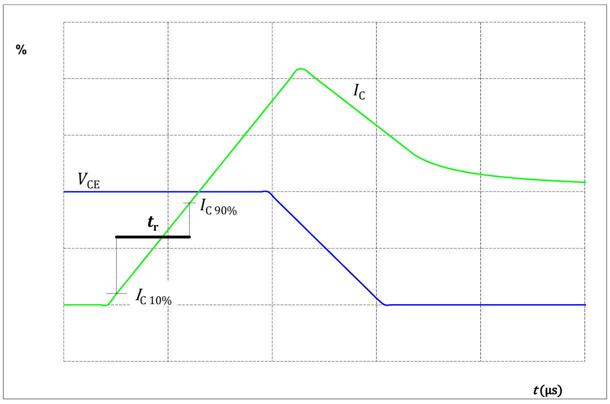


figure 57. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 58. **FWD**

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

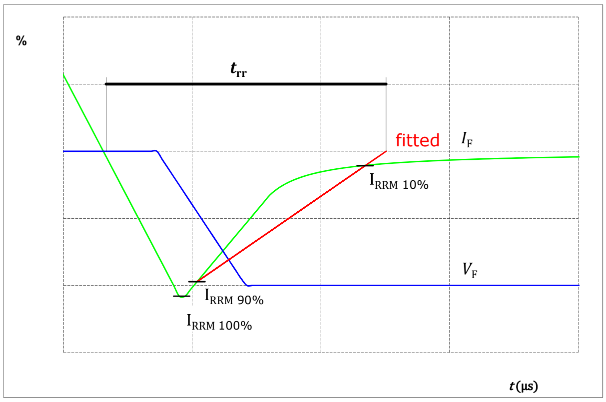
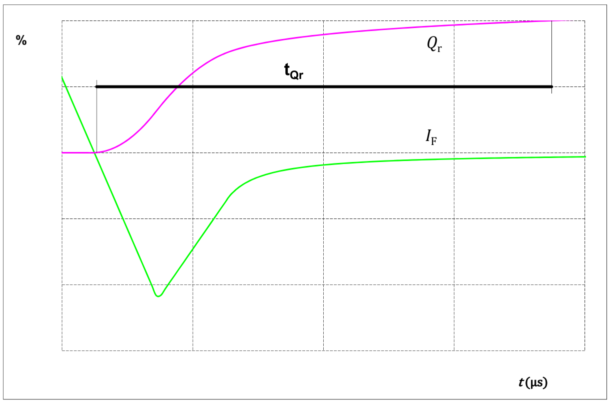


figure 59. **FWD**

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



10-FE06PPA030SJ04-LJ02B03Z
datasheet

Ordering Code

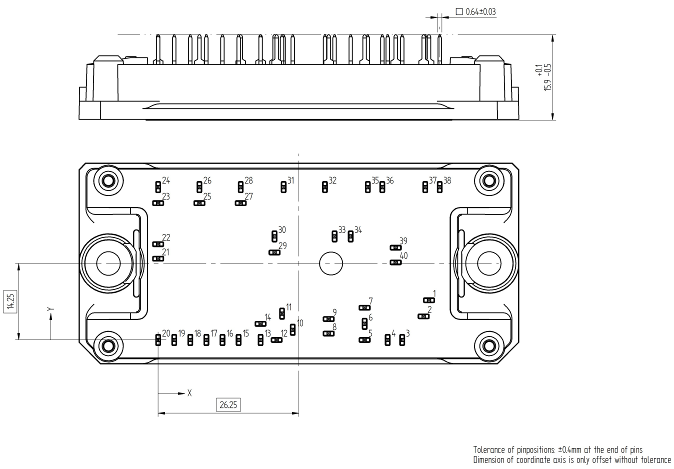
Version	Ordering Code
Without thermal paste	10-FE06PPA030SJ04-LJ02B03Z
With thermal paste (5,2 W/mK, PTM6000HV)	10-FE06PPA030SJ04-LJ02B03Z-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FE06PPA030SJ04-LJ02B03Z-/3/

Marking

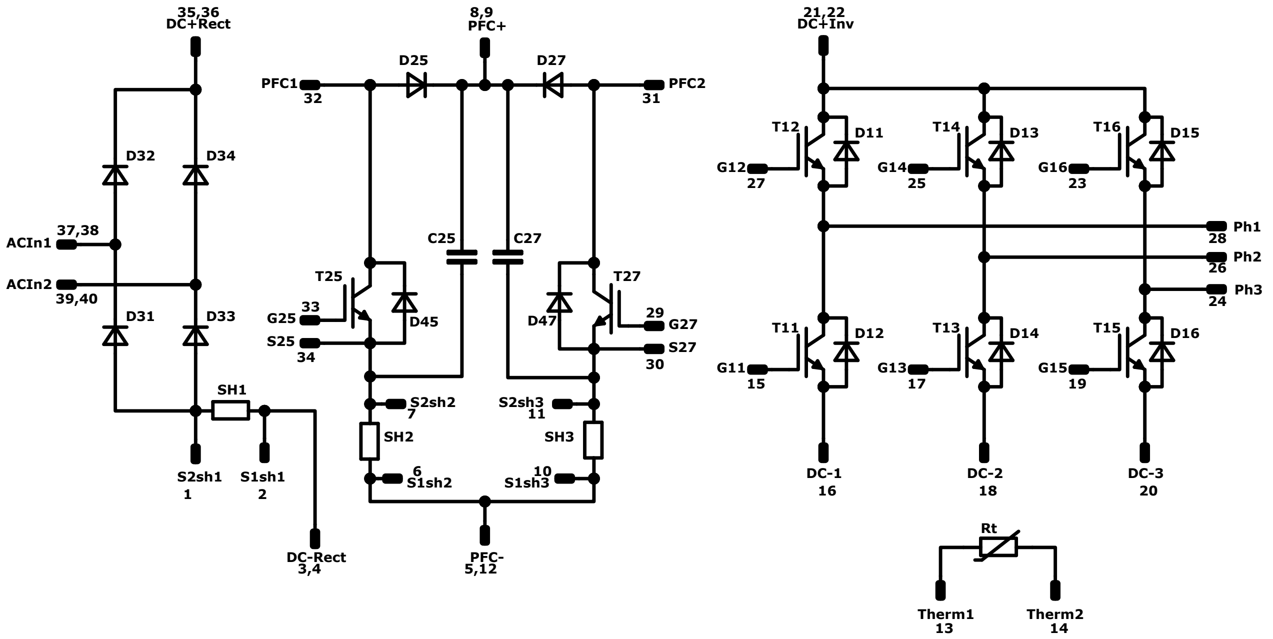
	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
		TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	50,5	7,4	S2sh1
2	49,5	4,4	S1sh1
3	45,5	0	DC-Rect
4	42,8	0	DC-Rect
5	38,5	0	PFC-
6	38,5	3	S1sh2
7	38,5	6	S2sh2
8	31,8	1,2	PFC+
9	31,8	3,9	PFC+
10	25,1	1,9	S1sh3
11	23,1	4,9	S2sh3
12	22,1	0	PFC-
13	19,1	0	Therm1
14	19,1	3	Therm2
15	15	0	G11
16	12	0	DC-1
17	9	0	G13
18	6	0	DC-2
19	3	0	G15
20	0	0	DC-3
21	0	15,15	DC+Inv
22	0	17,85	DC+Inv
23	0	25,5	G16
24	0	28,5	Ph3
25	7,7	25,5	G14
26	7,7	28,5	Ph2
27	15,4	25,5	G12
28	15,4	28,5	Ph1
29	21,7	16,3	G27
30	21,7	19,3	S27
31	23,4	28,5	PFC2
32	31,1	28,5	PFC1
33	32,9	19,3	G25
34	35,9	19,3	S25
35	39,1	28,5	DC+Rect
36	41,8	28,5	DC+Rect
37	49,8	28,5	ACIn1
38	52,5	28,5	ACIn1
39	44,3	17,2	ACIn2
40	44,3	14,45	ACIn2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	600 V	30 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	600 V	20 A	Inverter Diode	
T25, T27	IGBT	650 V	30 A	PFC Switch	
D25, D27	FWD	600 V	30 A	PFC Diode	
D45, D47	FWD	650 V	6 A	PFC Sw. Protection Diode	
D31, D32, D33, D34	Rectifier	1600 V	31 A	Rectifier Diode	
SH1	Shunt			PFC Shunt	
SH2, SH3	Shunt			Shunt	
C25, C27	Capacitor	630 V		Capacitor (PFC)	
Rt	Thermistor			Thermistor	

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-FE06PPA030SJ04-LJ02B03Z-D2-14	8 Jun. 2023	PFC Diode change	