10-FE06PPA050SJ01-LH54E08Z
datasheet

***flow*PIM 1 + PFC** **600 V / 50 A**

Topology features

- 2-leg interleaved PFC + Inverter
- On-board Capacitors
- Open Emitter configuration
- Shunt
- 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
- Solder pin
- Thermo-mechanical push-and-pull force relief

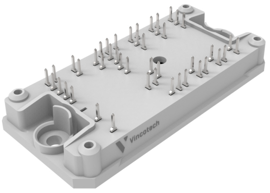
Target applications

- Embedded Drives
- Industrial Drives

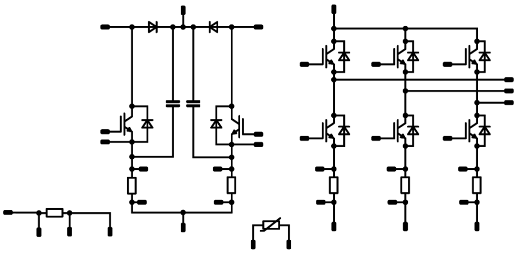
Types

- 10-FE06PPA050SJ01-LH54E08Z

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	49	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	81	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	36	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	58	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	47	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	81	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	53	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms T_j = 25 °C	480	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	73	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	20 (1)	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	33	W
Maximum junction temperature	T_{jmax}		175	°C

(1) limited by I_{FRM}

Parameter	Symbol	Conditions	Value	Unit
Inverter Shunt				
DC current	I		31,6	A
Power dissipation	P_{tot}	T_c = 70 °C	2	W
Operation Temperature	T_{op}		-65 ... 170	°C
PFC Shunt				
DC current	I		31,6	A
Power dissipation	P_{tot}	T_c = 70 °C	2	W
Operation Temperature	T_{op}		-65 ... 170	°C
Shunt				
DC current	I		63,2	A
Power dissipation	P_{tot}	T_c = 70 °C	4	W
Operation Temperature	T_{op}		-65 ... 170	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
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
Creepage distance				>12,7	mm
Clearance				8,56	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

Characteristic Values

Parameter	**Symbol**	**Conditions**					**Values**			**Unit**
			V_{GE} **[V]** V_{GS} **[V]**	V_{CE} **[V]** V_{DS} **[V]** V_{F} **[V]**	I_{C} **[A]** I_{D} **[A]** I_{F} **[A]**	T_{j} **[°C]**	**Min**	**Typ**	**Max**	
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0008	25	4,1	5,1	5,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25		1,49	1,8$^{(2)}$	V
						125		1,61		
						150		1,64		
Collector-emitter cut-off current	I_{CES}		0	600		25			2,8	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		1950		pF
Output capacitance	C_{oes}							83		pF
Reverse transfer capacitance	C_{res}							67		pF
Gate charge	Q_{g}	V_{CC} = 480 V	15		50	25		249		nC
Thermal										
Thermal resistance junction to sink$^{(3)}$	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,18		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	350	50	25		70		ns
						125		70		
						150		71,2		
Rise time	t_{r}					25		45,2		ns
						125		43,2		
						150		42,8		
Turn-off delay time	$t_{d(off)}$					25		114,8		ns
						125		133,6		
						150		138,6		
Fall time	t_{f}					25		22,47		ns
						125		34,2		
						150		41,12		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,62 µC				25		1,84		mWs
		Q_{rFWD}=3,09 µC				125		2,2		
		Q_{rFWD}=3,57 µC				150		2,28		
Turn-off energy (per pulse)	E_{off}					25		0,536		mWs
						125		0,839		
						150		0,941		

Characteristic Values

Parameter	**Symbol**	**Conditions**					**Values**			**Unit**
			V_{GE} **[V]** V_{GS} **[V]**	V_{CE} **[V]** V_{DS} **[V]** V_F **[V]**	I_C **[A]** I_D **[A]** I_F **[A]**	T_j **[°C]**	**Min**	**Typ**	**Max**	
Inverter Diode										
Static										
Forward voltage	V_F				30	25 150	1,25	1,64 1,55	1,95$^{(2)}$	V
Reverse leakage current	I_R	V_r = 600 V				25			27	µA
Thermal										
Thermal resistance junction to sink$^{(3)}$	$R_{th(j\text{-}s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,63		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=245 A/µs di/dt=545 A/µs di/dt=378 A/µs	±15	350	50	25 125 150		10,63 16,09 16,77		A
Reverse recovery time	t_{rr}					25 125 150		251,47 331,66 392,82		ns
Recovered charge	Q_r					25 125 150		1,62 3,09 3,57		µC
Reverse recovered energy	E_{rec}					25 125 150		0,406 0,762 0,892		mWs
Peak rate of fall of recovery current	$(\mathrm{d}i_{rf}/\mathrm{d}t)_{max}$					25 125 150		76,03 88,46 100,72		A/µs

Characteristic Values

Parameter	**Symbol**	**Conditions**					**Values**			**Unit**
			V_{GE} **[V]** V_{GS} **[V]**	V_{CE} **[V]** V_{DS} **[V]** V_{F} **[V]**	I_{C} **[A]** I_{D} **[A]** I_{F} **[A]**	T_j **[°C]**	**Min**	**Typ**	**Max**	
PFC Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0005	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,52 1,64 1,7	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		3000		pF
Output capacitance	C_{oes}							50		pF
Reverse transfer capacitance	C_{res}							11		pF
Gate charge	Q_g	V_{CC} = 520 V	15		50	25		120		nC
Thermal										
Thermal resistance junction to sink[3]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,17		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	0/15	400	50	25 125 150		16,12 15,82 15,96		ns
Rise time	t_r					25 125 150		6,68 8,23 8,62		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		86,51 103,58 108,24		ns
Fall time	t_f					25 125 150		2,44 10,89 11,76		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,799 µC Q_{rFWD}=2,02 µC Q_{rFWD}=2,53 µC				25 125 150		0,4 0,758 0,884		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,315 0,457 0,492		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				60	25 125 150		1,89 1,57 1,5	2,5(2)	V
Reverse leakage current	I_R	V_r = 600 V				25			25	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j\text{-}s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,3		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=6374 A/µs d*i*/d*t*=4375 A/µs d*i*/d*t*=4337 A/µs	0/15	400	50	25 125 150		76,33 106,22 117,33		A
Reverse recovery time	t_{rr}					25 125 150		20,32 35,44 40,54		ns
Recovered charge	Q_r					25 125 150		0,799 2,02 2,53		µC
Reverse recovered energy	E_{rec}					25 125 150		0,164 0,419 0,53		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		11479,58 8065,29 7530,06		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				10	25 125	1,23	1,67 1,54	1,87(2)	V
Reverse leakage current	I_R	V_r = 650 V				25			0,14	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,87		K/W
Inverter Shunt										
Static										
Resistance	R							2		mΩ
Temperature coeficient	tc								275	ppm/K
PFC Shunt										
Static										
Resistance	R							2		mΩ
Temperature coeficient	tc								275	ppm/K
Shunt										
Static										
Resistance	R							1		mΩ
Temperature coeficient	tc								275	ppm/K

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**	
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

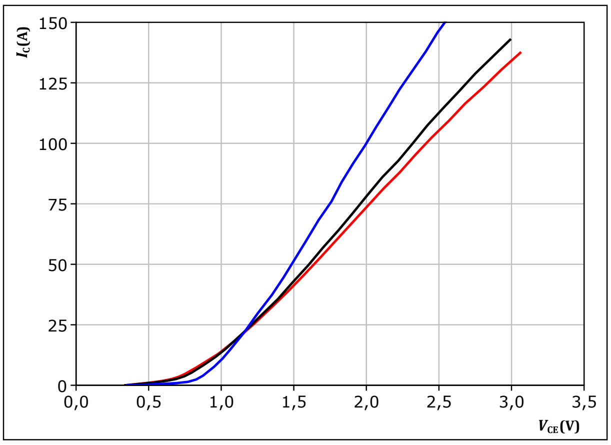
(3) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

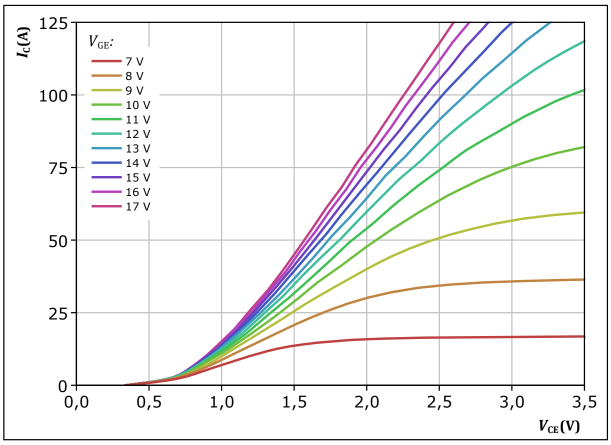


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



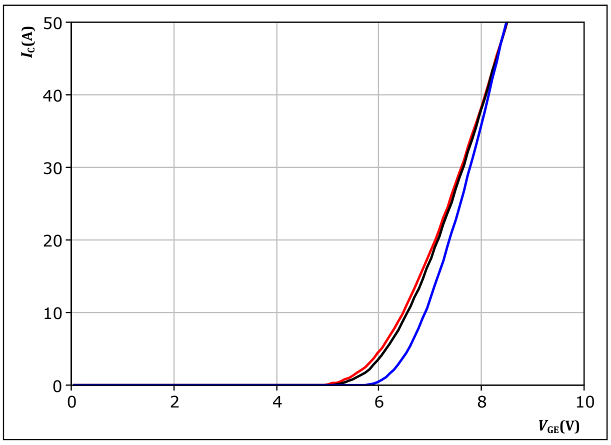
t_p =	250	µs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

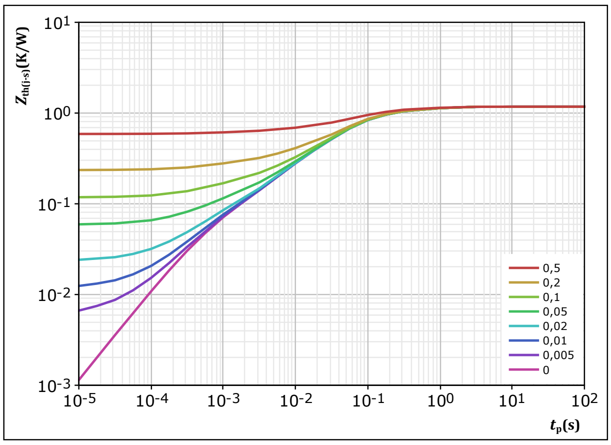


t_p =	250	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,176	K/W

IGBT thermal model values

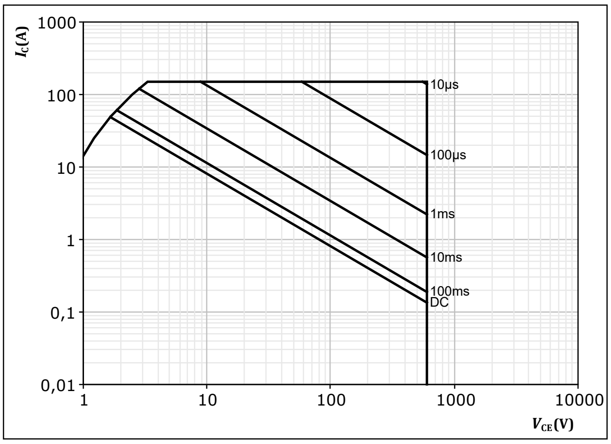
R (K/W)	τ (s)
1,28E-01	9,19E-01
3,00E-01	1,49E-01
5,67E-01	4,76E-02
1,34E-01	6,63E-03
4,70E-02	5,83E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})



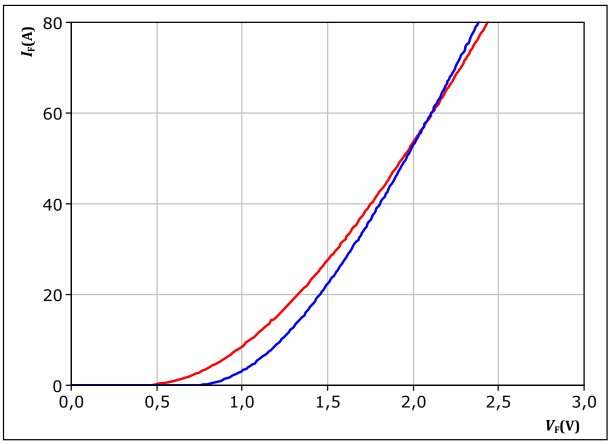
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

I_F = f(V_F)



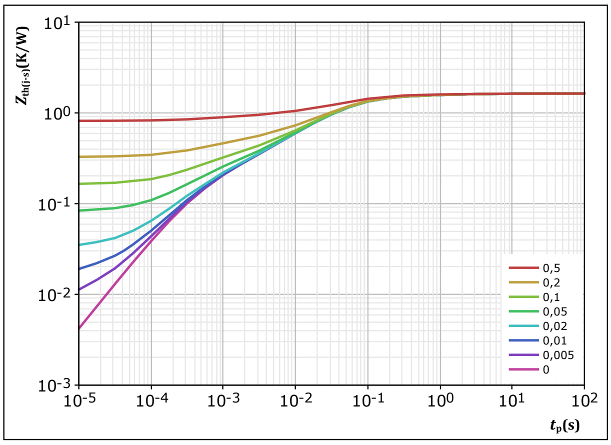
t_p = 250 µs

T_j: 25 °C, 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

$R_{th(j-s)}$ = 1,633 K/W

FWD thermal model values

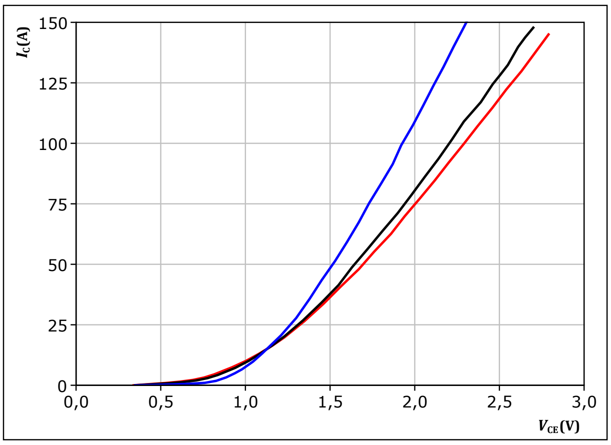
R (K/W)	τ (s)
7,13E-02	2,70E+00
1,55E-01	3,01E-01
7,25E-01	5,48E-02
3,93E-01	1,54E-02
1,57E-01	2,76E-03
1,32E-01	4,03E-04

PFC Switch Characteristics

figure 8. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

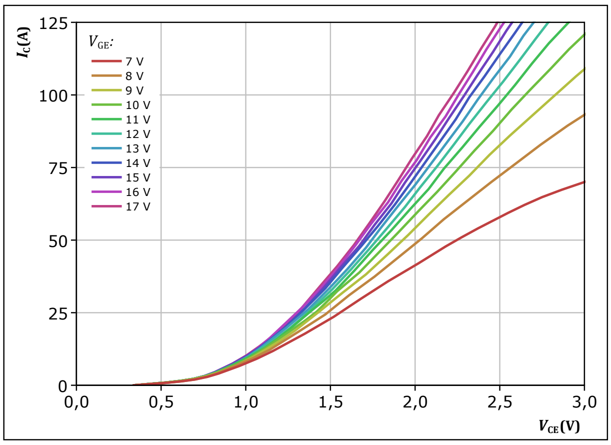


t_p = 250 µs
V_{GE} = 15 V
T_j: 25 °C, 125 °C, 150 °C

figure 9. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

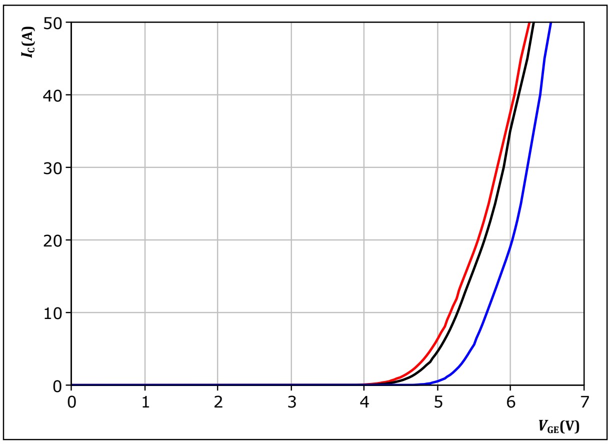


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 10. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

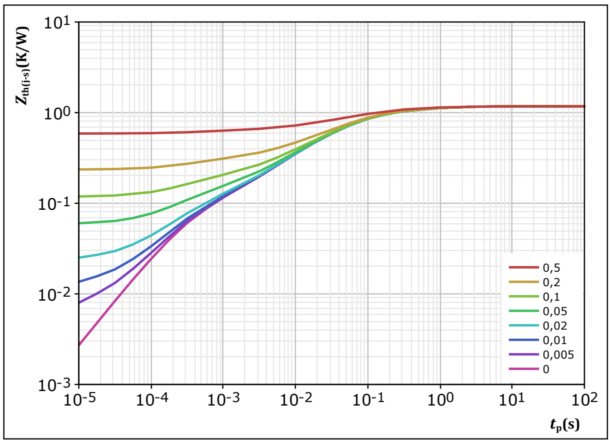


t_p = 250 µs
V_{CE} = 10 V
T_j: 25 °C, 125 °C, 150 °C

figure 11. **IGBT**

Transient thermal impedance as a function of pulse width

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



D = t_p / T
$R_{th(j-s)}$ = 1,174 K/W

IGBT thermal model values

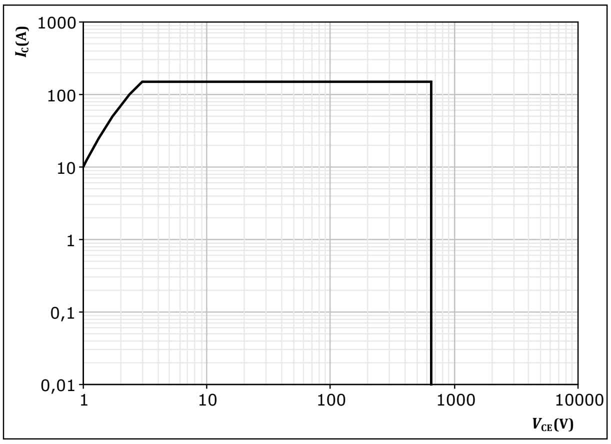
R (K/W)	τ (s)
9,21E-02	1,52E+00
2,50E-01	2,21E-01
4,87E-01	5,30E-02
2,29E-01	1,06E-02
4,67E-02	2,01E-03
6,92E-02	3,15E-04

PFC Switch Characteristics

figure 12. **IGBT**

Safe operating area

I_C = f(V_{CE})



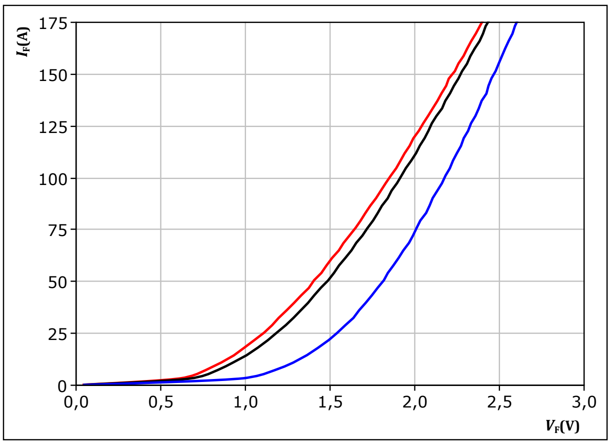
D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

PFC Diode Characteristics

figure 13. **FWD**

Typical forward characteristics

I_F = f(V_F)



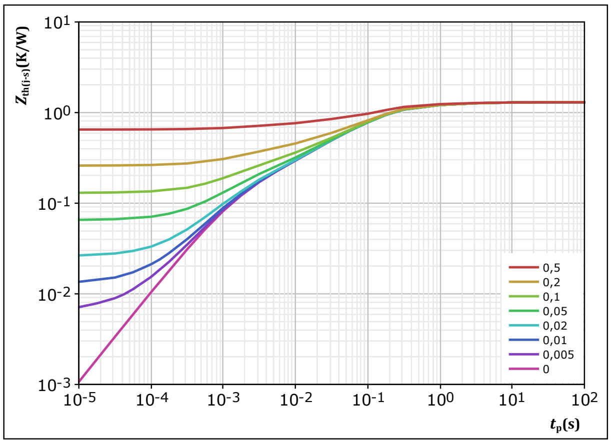
t_p = 250 µs

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

$R_{th(j-s)}$ = 1,299 K/W

FWD thermal model values

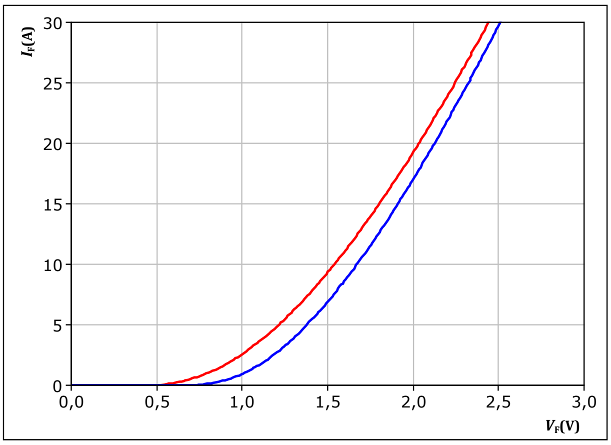
R (K/W)	τ (s)
6,87E-02	3,97E+00
2,08E-01	5,47E-01
7,02E-01	1,09E-01
2,07E-01	1,20E-02
1,14E-01	1,37E-03

PFC Sw. Protection Diode Characteristics

figure 15. **FWD**

Typical forward characteristics

I_F = f(V_F)



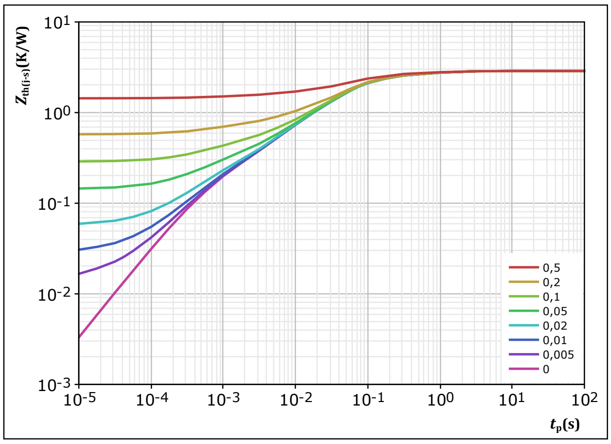
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 16. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,874 K/W

FWD thermal model values

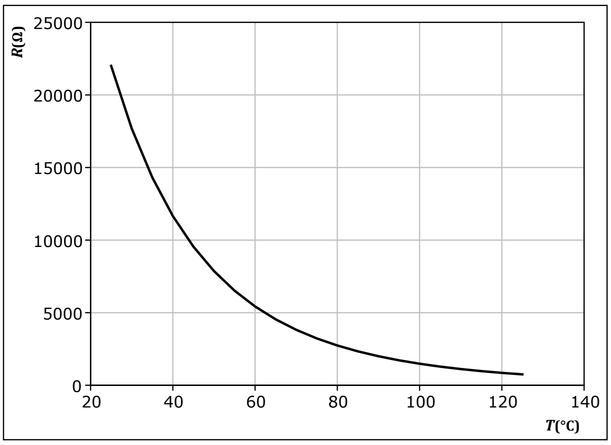
R (K/W)	τ (s)
2,86E-01	1,08E+00
5,75E-01	1,73E-01
1,57E+00	4,54E-02
3,05E-01	5,64E-03
1,34E-01	5,58E-04

Thermistor Characteristics

figure 17. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

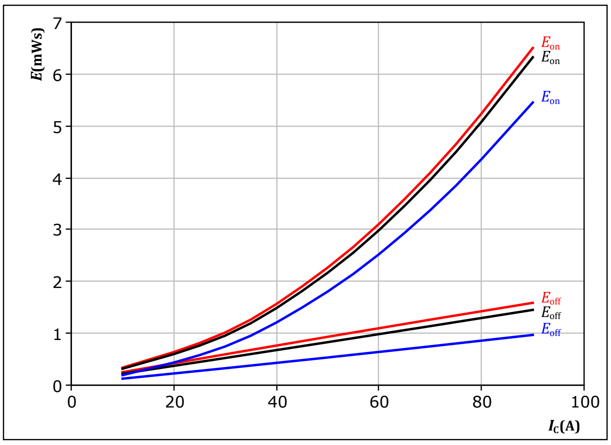


Inverter Switching Characteristics

figure 18. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



With an inductive load at

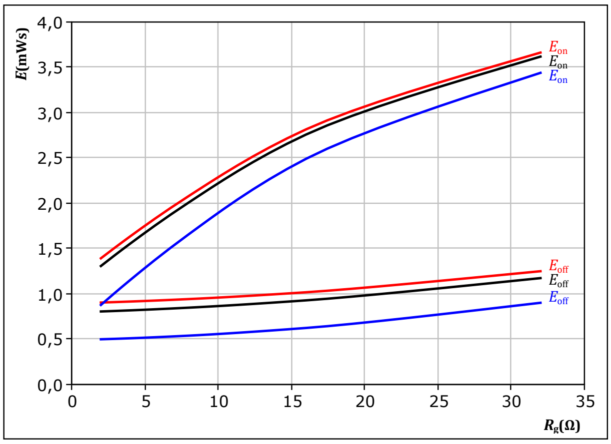
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 8 Ω
R_{goff} = 8 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 19. **IGBT**

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

E = f(R_g)



With an inductive load at

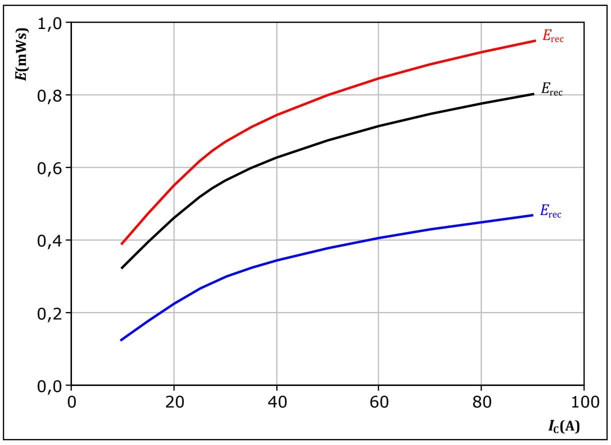
V_{CE} = 350 V
V_{GE} = ±15 V
I_C = 50 A

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

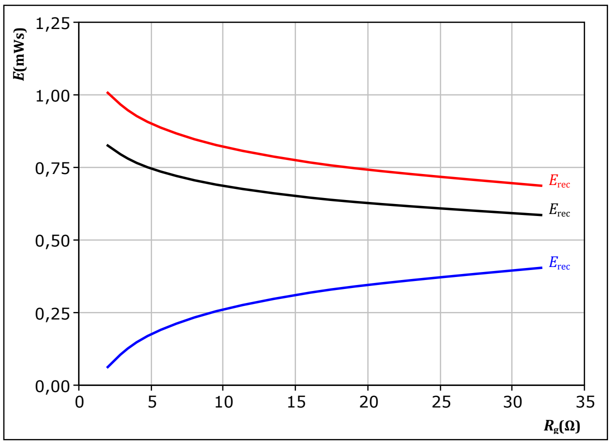
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 8 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 21. **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
V_{GE} = ±15 V
I_C = 50 A

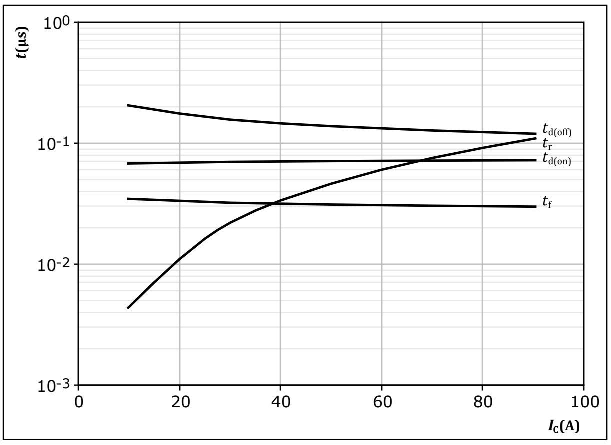
T_j:
— 25 °C
— 125 °C
— 150 °C

Inverter Switching Characteristics

figure 22. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



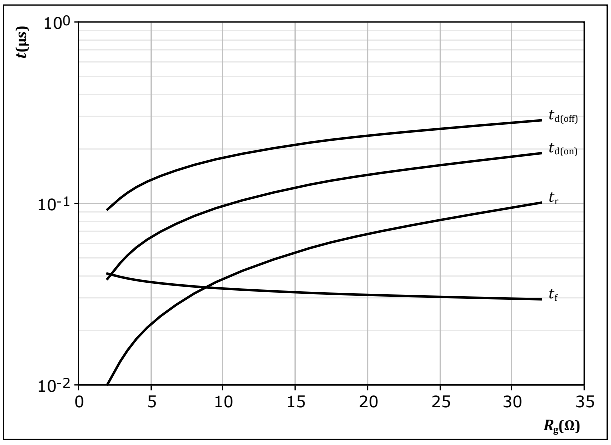
With an inductive load at

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

figure 23. **IGBT**

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

t = f(R_g)



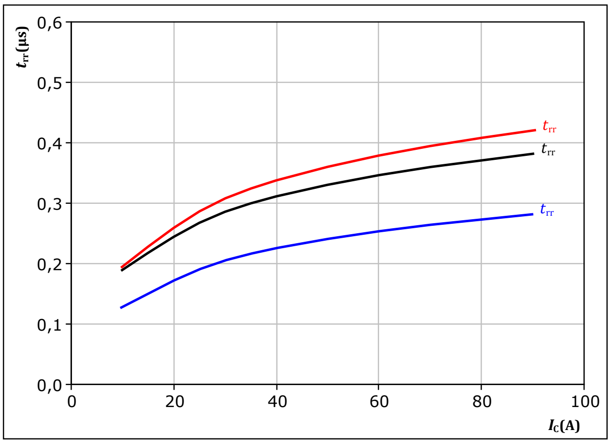
With an inductive load at

T_j = 150 °C
V_{CE} = 350 V
V_{GE} = ±15 V
I_C = 50 A

figure 24. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

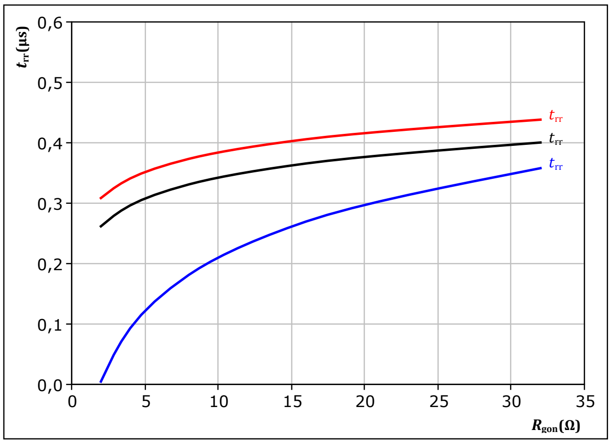
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 8 Ω

T_j:
25 °C
125 °C
150 °C

figure 25. **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 = 50 A

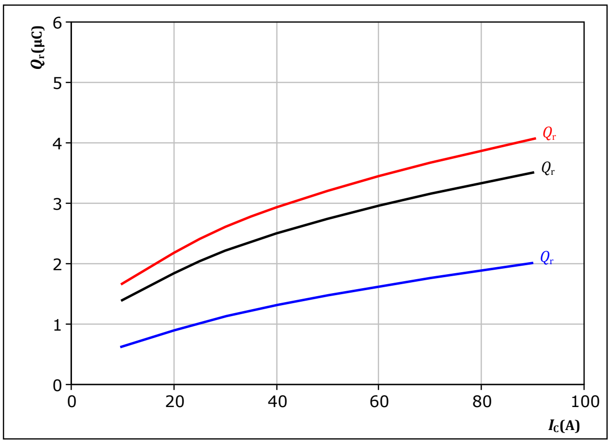
T_j:
25 °C
125 °C
150 °C

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

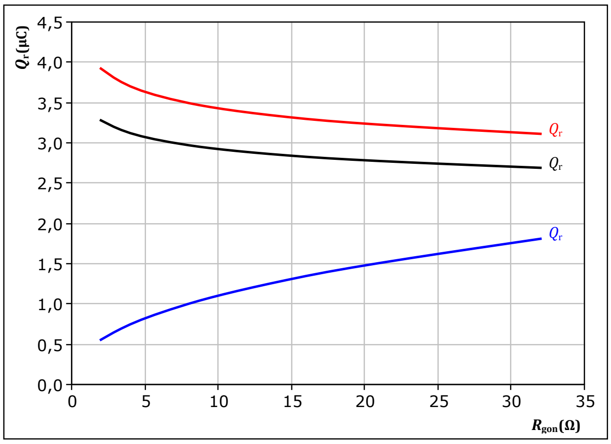
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 8 Ω

T_j:
25 °C
125 °C
150 °C

figure 27. **FWD**

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

Q_r = f(R_{gon})



With an inductive load at

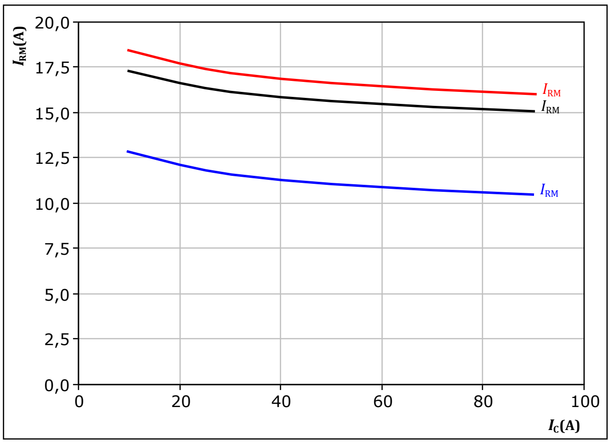
V_{CE} = 350 V
V_{GE} = ±15 V
I_C = 50 A

T_j:
25 °C
125 °C
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

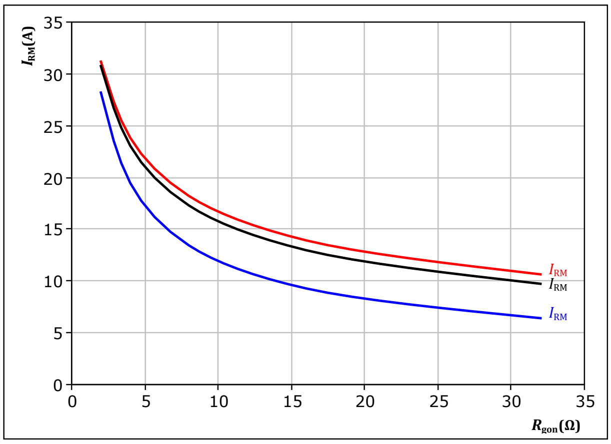
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 8 Ω

T_j:
25 °C
125 °C
150 °C

figure 29. **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
V_{GE} = ±15 V
I_C = 50 A

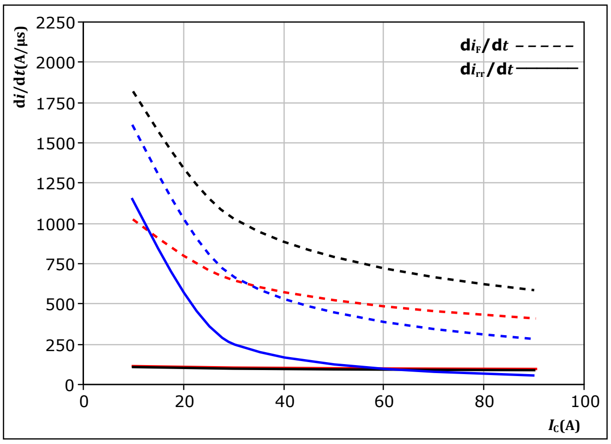
T_j:
25 °C
125 °C
150 °C

Inverter Switching Characteristics

figure 30. **FWD**

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

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



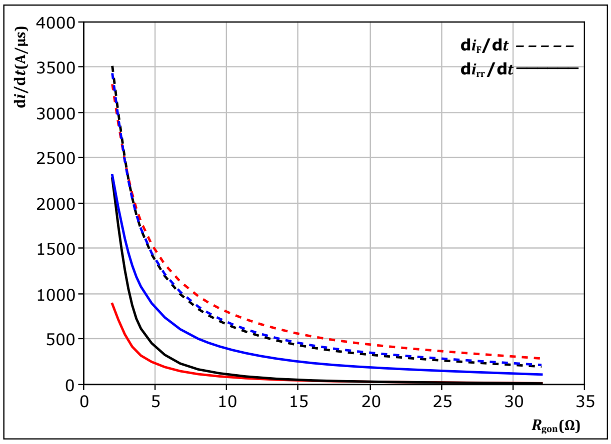
With an inductive load at

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

figure 31. **FWD**

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

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



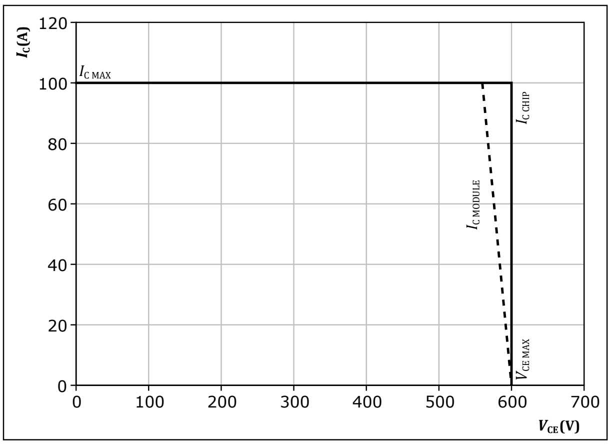
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	50	A		150 °C

figure 32. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



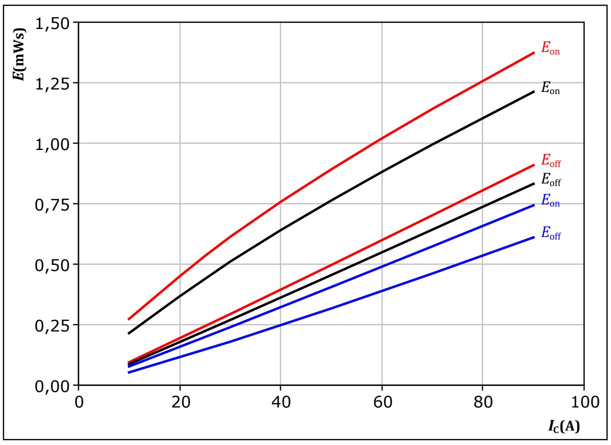
At			
	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

PFC Switching Characteristics

figure 33. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



With an inductive load at

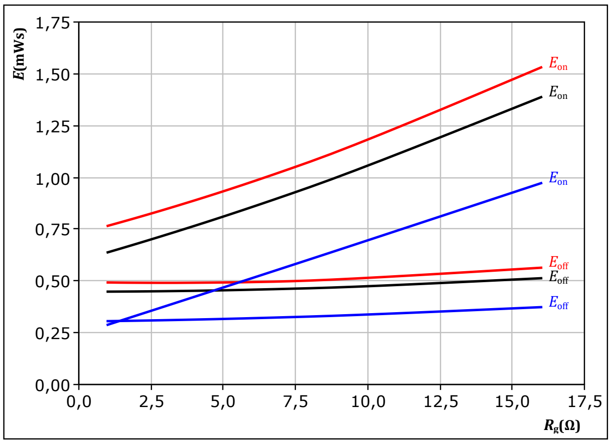
V_{CE} = 400 V
V_{GE} = 0/15 V
R_{gon} = 4 Ω
R_{goff} = 4 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 34. **IGBT**

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

E = f(R_g)



With an inductive load at

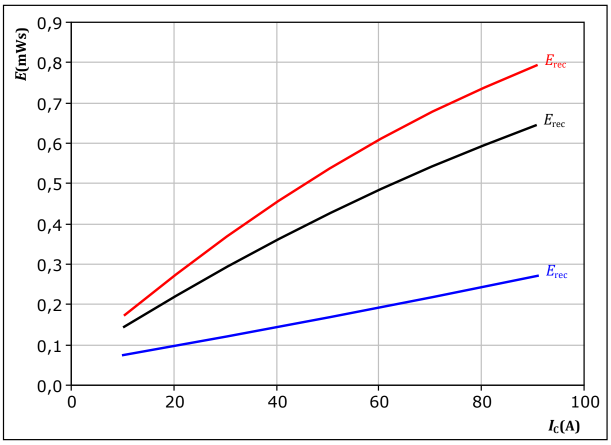
V_{CE} = 400 V
V_{GE} = 0/15 V
I_C = 50 A

T_j:
— 25 °C
— 125 °C
— 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

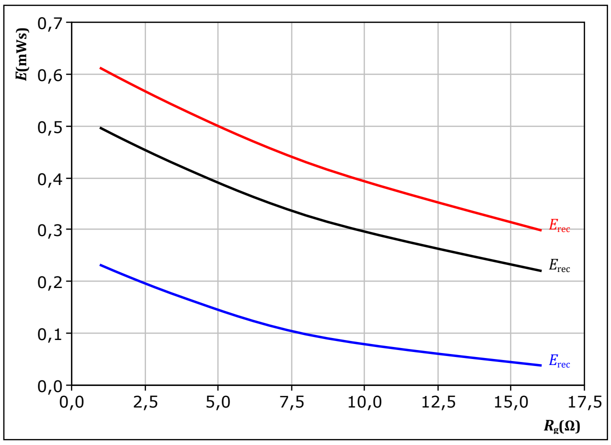
V_{CE} = 400 V
V_{GE} = 0/15 V
R_{gon} = 4 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 36. **FWD**

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

E_{rec} = f(R_g)



With an inductive load at

V_{CE} = 400 V
V_{GE} = 0/15 V
I_C = 50 A

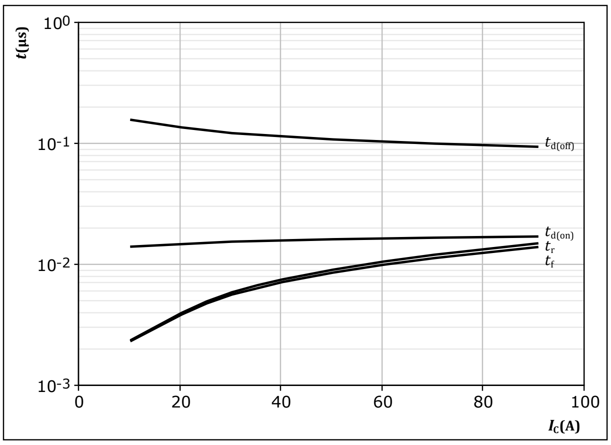
T_j:
— 25 °C
— 125 °C
— 150 °C

PFC Switching Characteristics

figure 37. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



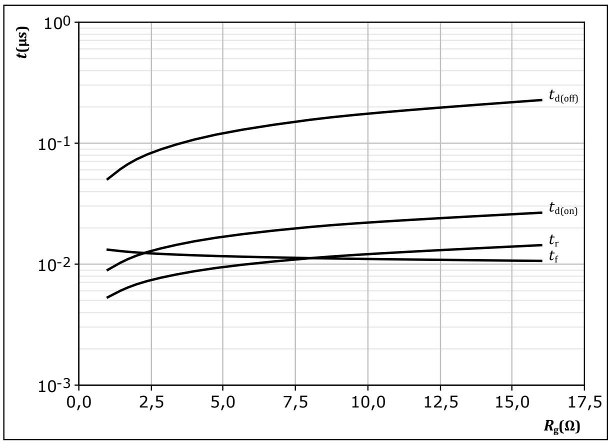
With an inductive load at

T_j = 150 °C
V_{CE} = 400 V
V_{GE} = 0/15 V
R_{gon} = 4 Ω
R_{goff} = 4 Ω

figure 38. **IGBT**

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

t = f(R_g)



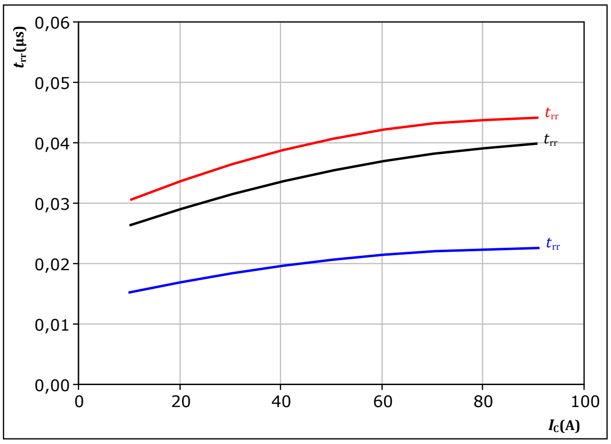
With an inductive load at

T_j = 150 °C
V_{CE} = 400 V
V_{GE} = 0/15 V
I_C = 50 A

figure 39. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

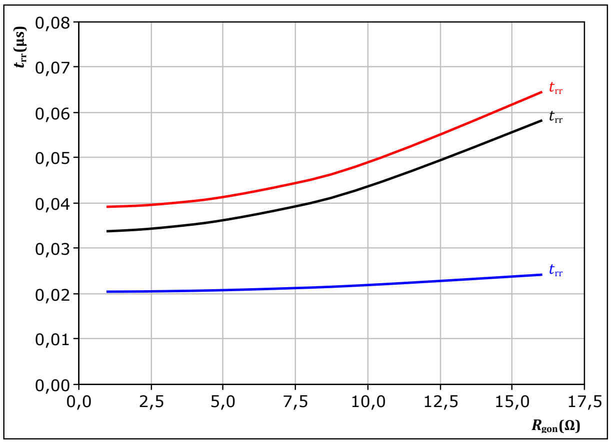
V_{CE} = 400 V
V_{GE} = 0/15 V
R_{gon} = 4 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 40. **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 = 50 A

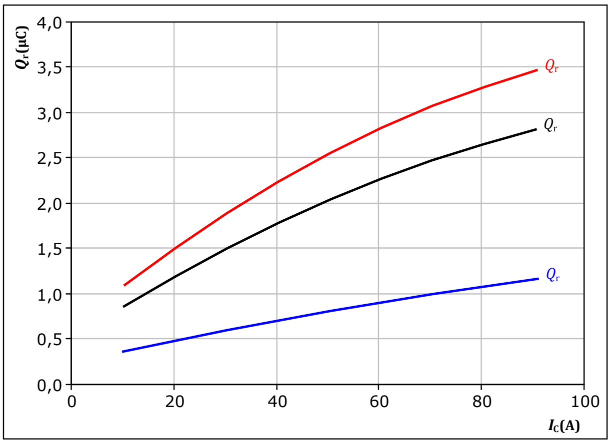
T_j:
— 25 °C
— 125 °C
— 150 °C

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

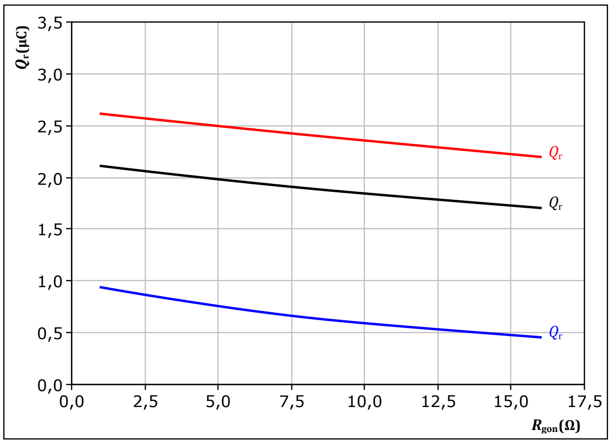
V_{CE} = 400 V
V_{GE} = 0/15 V
R_{gon} = 4 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 42. **FWD**

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

Q_r = f(R_{gon})



With an inductive load at

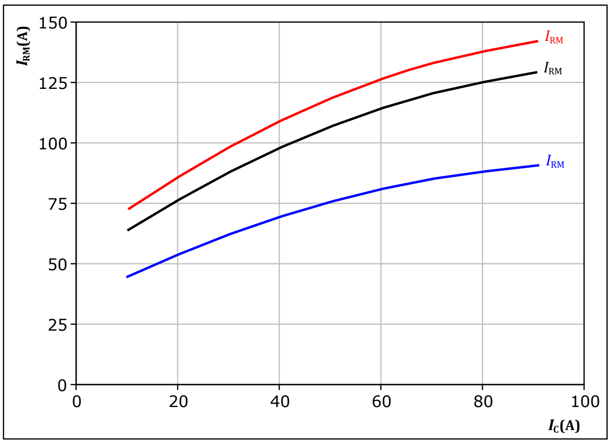
V_{CE} = 400 V
V_{GE} = 0/15 V
I_C = 50 A

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 43. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



With an inductive load at

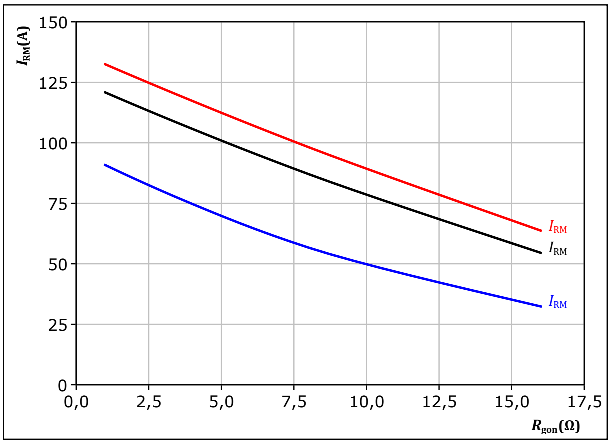
V_{CE} = 400 V
V_{GE} = 0/15 V
R_{gon} = 4 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 44. **FWD**

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

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



With an inductive load at

V_{CE} = 400 V
V_{GE} = 0/15 V
I_C = 50 A

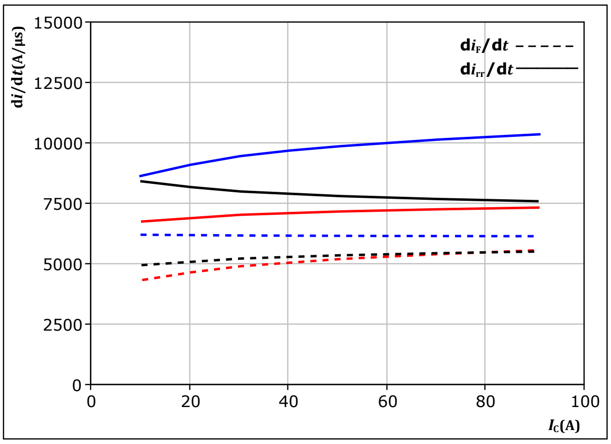
T_j:
— 25 °C
— 125 °C
— 150 °C

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

V_{GE} = 0/15 V

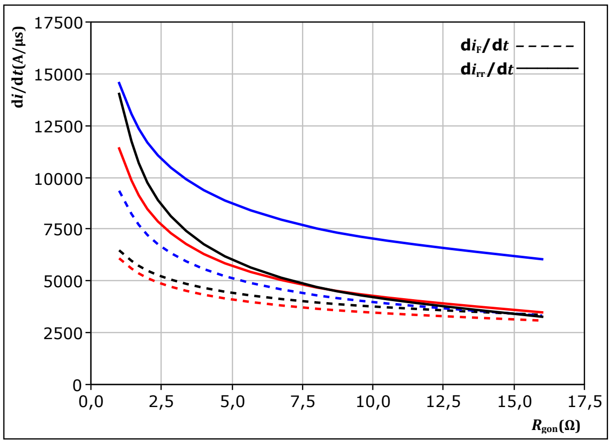
R_{gon} = 4 Ω

T_j: 25 °C / 125 °C / 150 °C

figure 46. **FWD**

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

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



With an inductive load at

V_{CE} = 400 V

V_{GE} = 0/15 V

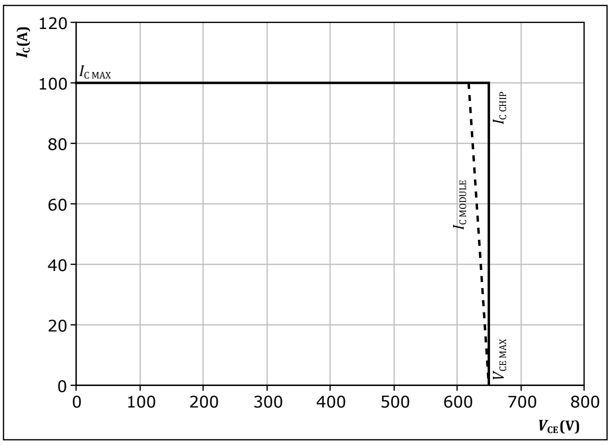
I_C = 50 A

T_j: 25 °C / 125 °C / 150 °C

figure 47. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At T_j = 150 °C

R_{gon} = 4 Ω

R_{goff} = 4 Ω

Switching Definitions

figure 48. **IGBT**

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

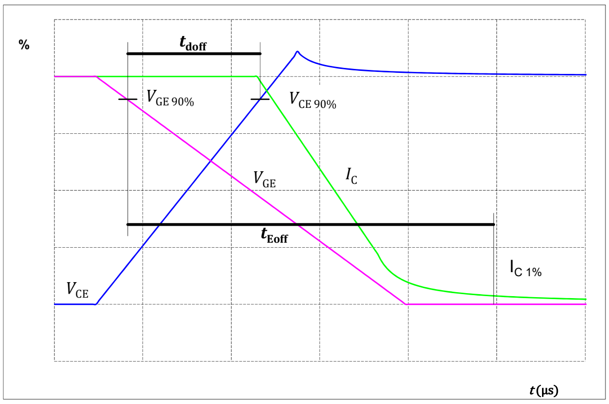


figure 49. **IGBT**

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

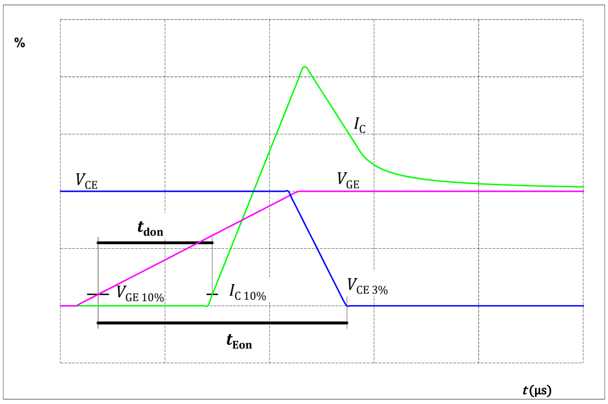


figure 50. **IGBT**

Turn-off Switching Waveforms & definition of t_f

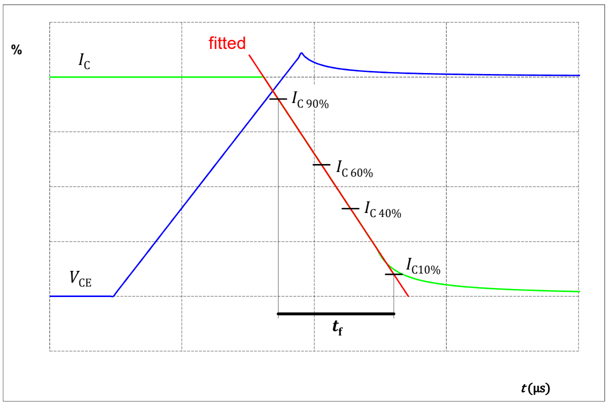
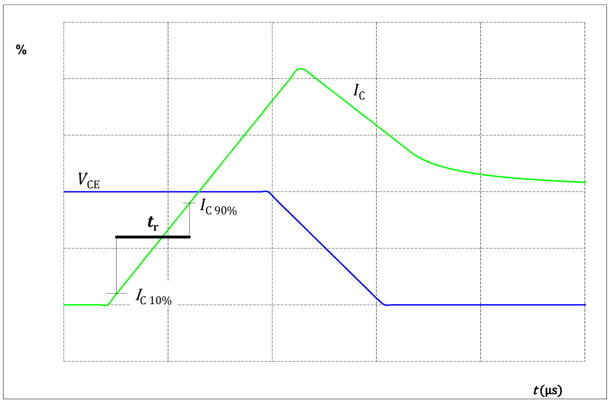


figure 51. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 52. **FWD**

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

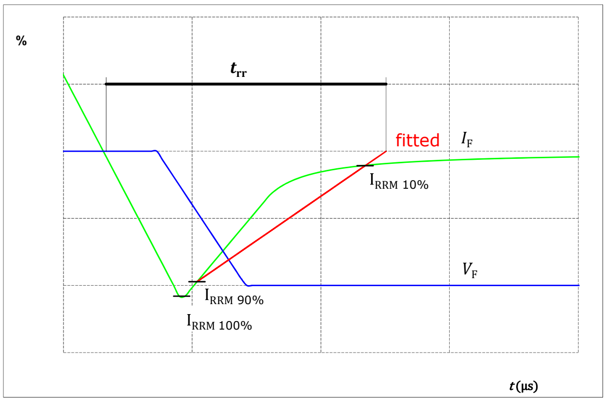
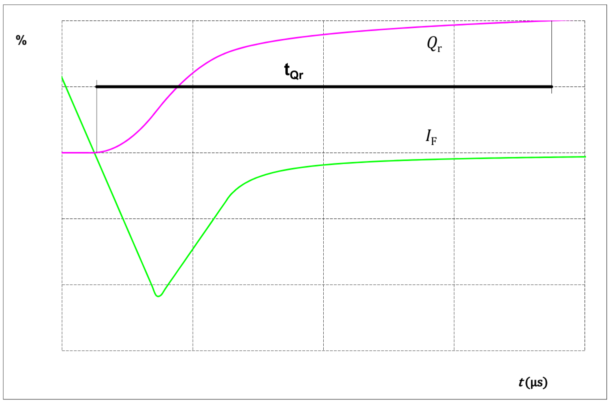


figure 53. **FWD**

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



Ordering Code

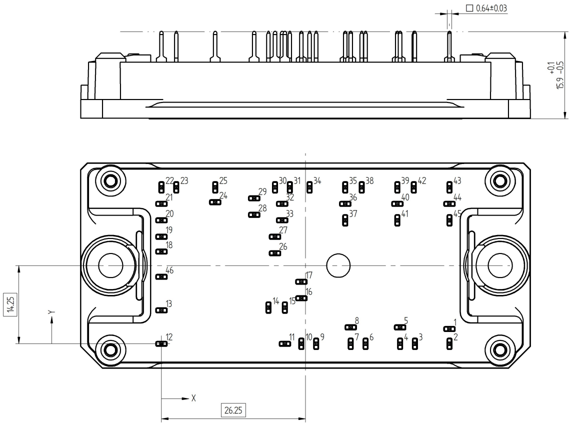
Version	Ordering Code
Without thermal paste	10-FE06PPA050SJ01-LH54E08Z
With thermal paste (5,2 W/mK, PTM6000HV)	10-FE06PPA050SJ01-LH54E08Z-/7/

Marking

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

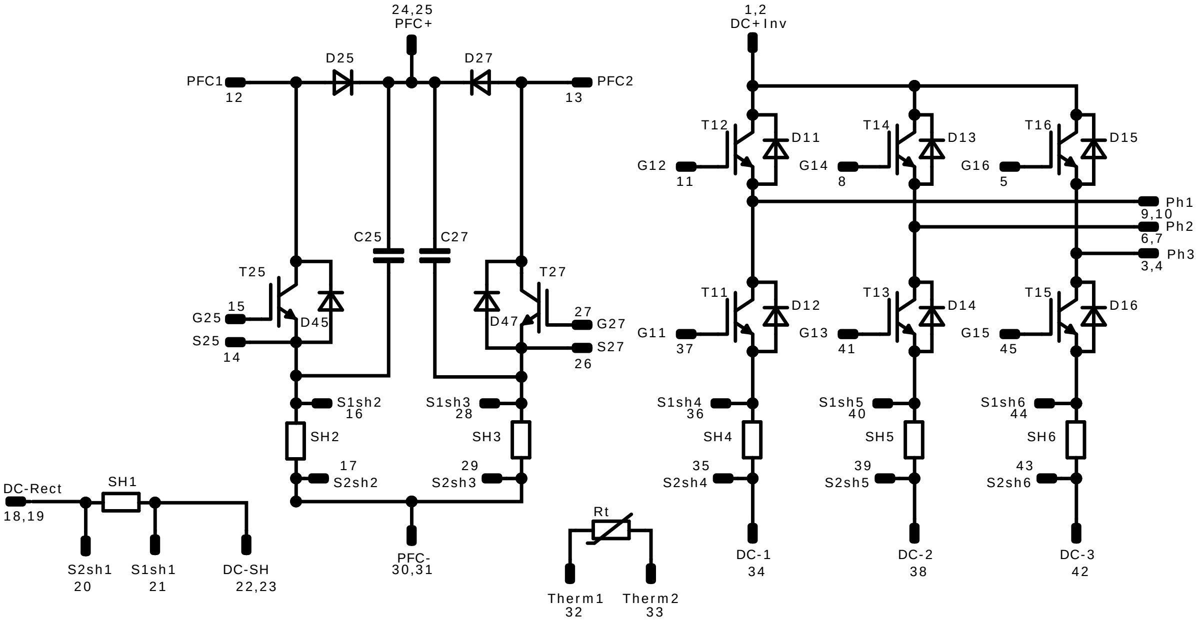
Outline

Pin table [mm]			
Pin	X	Y	Function
1	52,5	2,7	DC+Inv
2	52,5	0	DC+Inv
3	46,2	0	Ph3
4	43,5	0	Ph3
5	43,5	3	G16
6	37,2	0	Ph2
7	34,5	0	Ph2
8	34,5	3	G14
9	28,2	0	Ph1
10	25,5	0	Ph1
11	22,5	0	G12
12	0	0	PFC1
13	0	6,1	PFC2
14	19,5	6,6	S25
15	22,5	6,6	G25
16	25,5	8,3	S1sh2
17	25,5	11,3	S2sh2
18	0	16,8	DC-Rect
19	0	19,5	DC-Rect
20	0	22,5	S2sh1
21	0	25,5	S1sh1
22	0	28,5	DC-SH
23	2,7	28,5	DC-SH
24	9,8	25,8	PFC+
25	9,8	28,5	PFC+
26	20,7	16,5	S27
27	20,7	19,5	G27
28	16,9	23,5	S1sh3
29	16,9	26,5	S2sh3
30	20,7	28,5	PFC-
31	23,4	28,5	PFC-
32	22	25,5	Therm1
33	22	22,5	Therm2
34	27	28,5	DC-1
35	33,5	28,5	S2sh4
36	33,5	25,5	S1sh4
37	33,5	22,5	G11
38	36,5	28,5	DC-2
39	43	28,5	S2sh5
40	43	25,5	S1sh5
41	43	22,5	G13
42	46	28,5	DC-3
43	52,5	28,5	S2sh6
44	52,5	25,5	S1sh6
45	52,5	22,5	G15
46	not assembled		



Tolerance of pinpositions: ±0.4mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	600 V	50 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	600 V	30 A	Inverter Diode	
T25, T27	IGBT	650 V	50 A	PFC Switch	
D25, D27	FWD	600 V	60 A	PFC Diode	
D45, D47	FWD	650 V	10 A	PFC Sw. Protection Diode	
SH4, SH5, SH6	Shunt			Inverter Shunt	
SH2, SH3	Shunt			PFC Shunt	
SH1	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 UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}$=175°C and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-FE06PPA050SJ01-LH54E08Z-D2-14	7 Nov. 2025	Change PFC Diode according to PCN 27-2022	

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
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.