Vincotech

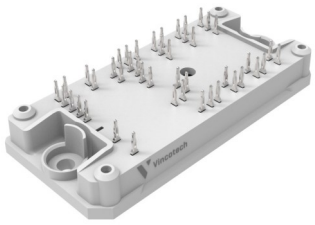
10-PG06PPA050SJ01-LH54E08T
datasheet

flowPIM 1 + PFC **600 V / 50 A**

Features

- Highly integrated PIM with interleaved PFC circuit
- High switching frequency PFC circuit
- On-board capacitors
- New generation high speed IGBTs in the inverter
- Emitter shunts

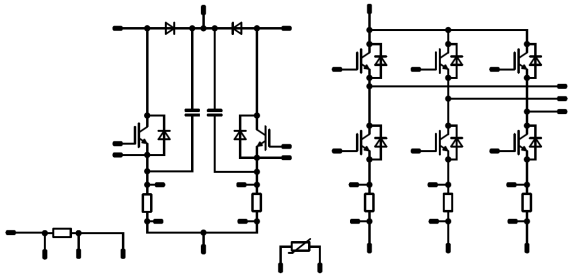
flow 1 12 mm housing



Target applications

- Embedded Drives
- Industrial Drives

Schematic



Types

- 10-PG06PPA050SJ01-LH54E08T

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		600	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	48	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 Vcc = 400 V T_j = 150 °C	5	µs
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Diode				
Peak repetitive reverse voltage	V_{RRM}		600	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	35	A
Repetitive peak forward current	I_{FRM}		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	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
PFC Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	49	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	84	W
Maximum junction temperature	T_{jmax}		175	°C
PFC Sw. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	14	A
Repetitive peak forward current	I_{FRM}		20	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	33	W
Maximum junction temperature	T_{jmax}		175	°C
Shunt				
Max DC current	I_{MAX}	T_c = 25 °C	63	A
Power dissipation	P_{tot}	T_c = 70 °C	4	W

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
PFC Shunt				
Maximum DC current	I_{MAX}	T_c = 25 °C	32	A
Power dissipation	P_{tot}	T_c = 70 °C	2	W
Inverter Shunt				
Maximum DC current	I_{MAX}	T_c = 25 °C	32	A
Power dissipation	P_{tot}	T_c = 70 °C	2	W
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
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance			8,05	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0008	25	4,1	5,1	5,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,48 1,60 1,64	1,8	V
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		
Reverse transfer capacitance	C_{res}							67		
Gate charge	Q_g		15	480	50	25		249		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	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	25 125 150		70 70 71		ns
Rise time	t_r					25 125 150		45 43 43		
Turn-off delay time	$t_{d(off)}$					25 125 150		115 134 139		
Fall time	t_f					25 125 150		22 34 41		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 1,6 µC Q_{rFWD} = 3,1 µC Q_{rFWD} = 3,6 µC				25 125 150		1,838 2,198 2,277		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,536 0,839 0,941		

Characteristic Values

Parameter	Symbol	Conditions					Value			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		1,64 1,56	1,95	V
Reverse leakage current	I_R			600		25			27	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,63		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 245 A/µs di/dt = 545 A/µs di/dt = 378 A/µs	±15	350	50	25 125 150		11 16 17		A
Reverse recovery time	t_{rr}					25 125 150		251 332 393		ns
Recovered charge	Q_r					25 125 150		1,615 3,089 3,567		µC
Reverse recovered energy	E_{rec}					25 125 150		0,406 0,762 0,892		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		76 88 101		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Value			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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0005	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,51 1,65 1,69	2,22	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		
Reverse transfer capacitance	C_{res}							11		
Gate charge	Q_g		15	520	50	25		120		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	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		15 13 15		ns
Rise time	t_r					25 125 150		6 7 8		
Turn-off delay time	$t_{d(off)}$					25 125 150		82 97 101		
Fall time	t_f					25 125 150		3 6 8		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,9 µC Q_{rFWD} = 1,8 µC Q_{rFWD} = 2,3 µC				25 125 150		0,429 0,668 0,690		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,152 0,383 0,471		

Characteristic Values

Parameter	Symbol	Conditions					Value			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				50	25 125 150		2,17 1,87 1,80	2,6	V
Reverse leakage current	I_R			650		25			10	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,14		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 6122 A/µs di/dt = 5344 A/µs di/dt = 4864 A/µs	0 / 15	400	50	25 125 150		63 83 92		A
Reverse recovery time	t_{rr}					25 125 150		17 47 54		ns
Recovered charge	Q_r					25 125 150		0,941 1,793 2,268		µC
Reverse recovered energy	E_{rec}					25 125 150		0,212 0,370 0,547		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		14126 8573 6729		A/µs
PFC Sw. Protection Diode										
Static										
Forward voltage	V_F				10	25 125		1,67 1,56	1,87	V
Reverse leakage current	I_R			650		25			0,14	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,87		K/W
Shunt										
Resistance	R							1		mΩ
Tolerance*								1		%
Temperature coefficient	tc					20 - 60			75	ppm/K

* Nominal tolerance of the component as shown in manufacturer's datasheet. **Not tested in production**

Characteristic Values

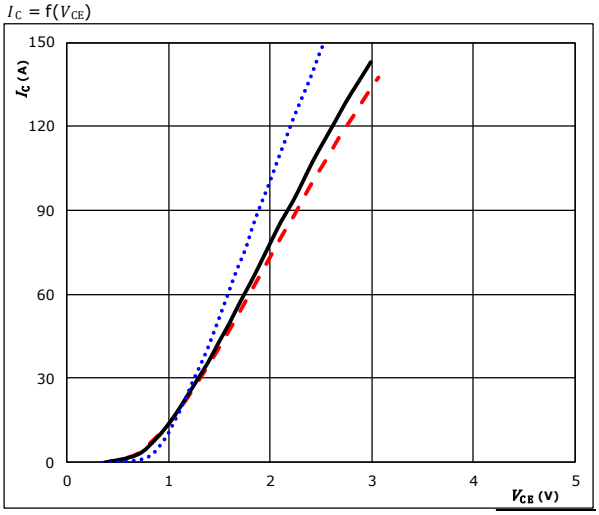
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
PFC Shunt										
Resistance	R							2		mΩ
Tolerance								1		%
Temperature coefficient	tc					20 - 60			75	ppm/K
* Nominal tolerance of the component as shown in manufacturer's datasheet. **Not tested in production**										
Inverter Shunt										
Resistance	R							2		mΩ
Tolerance								1		%
Temperature coefficient	tc					20 - 60			75	ppm/K
* Nominal tolerance of the component as shown in manufacturer's datasheet. **Not tested in production**										
Capacitor (PFC)										
Capacitance	C							33		nF
Tolerance							-5		+5	%
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

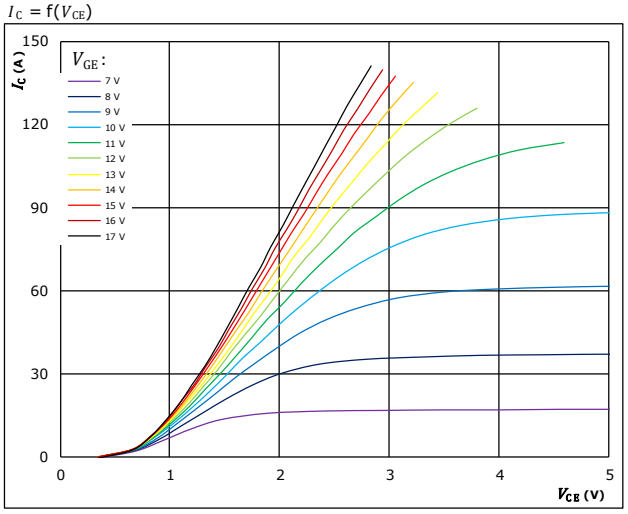


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

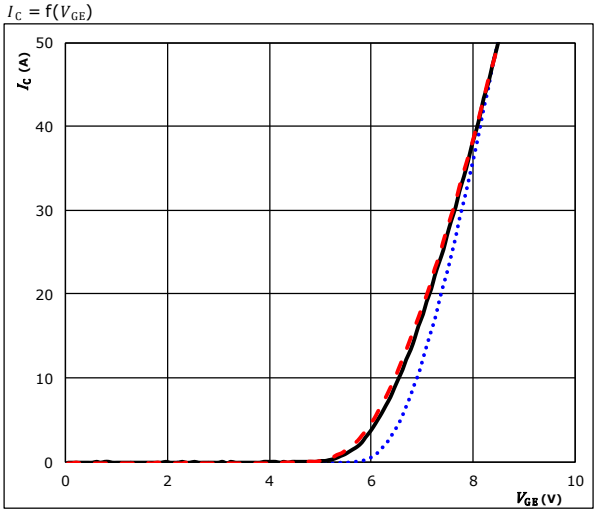


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

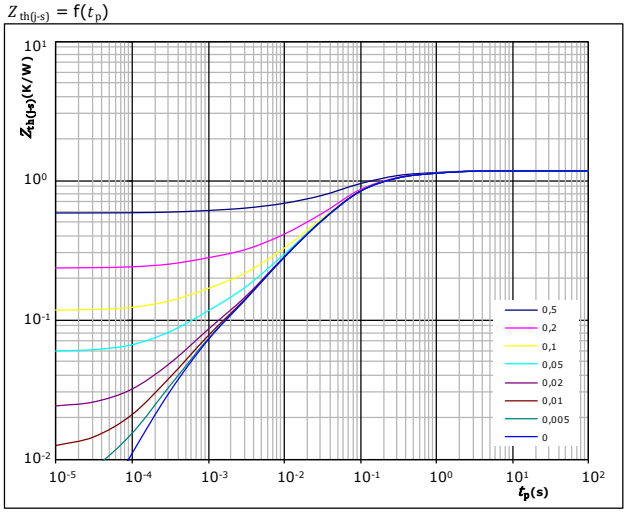


t_p =	100	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,18	K/W

IGBT thermal model values

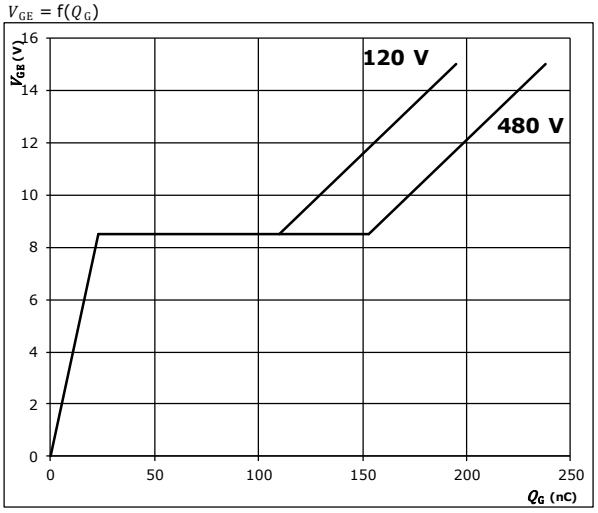
R (K/W)	τ (s)
1,28E-01	9,19E-01
3,00E-01	1,49E-01
5,67E-01	4,76E-02
1,34E-01	6,63E-03
4,70E-02	5,83E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

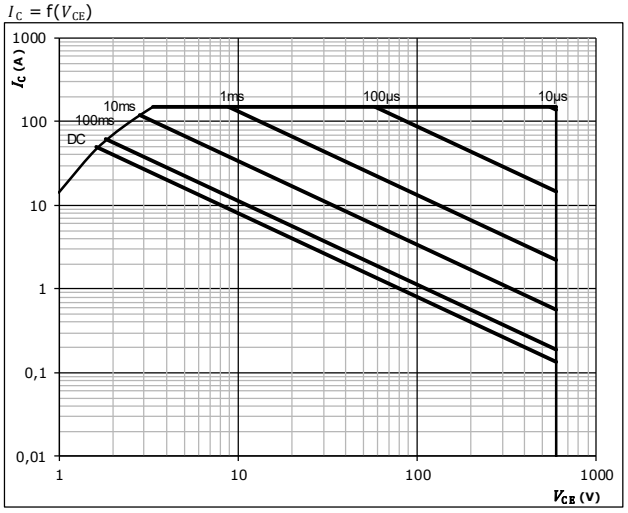


I_C = 50 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



D = single pulse

T_s = 80 °C

V_{GE} = ±15 V

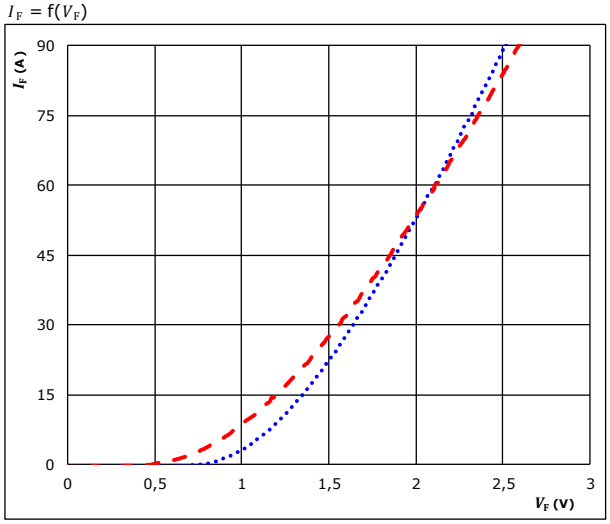
T_j = T_{jmax}

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



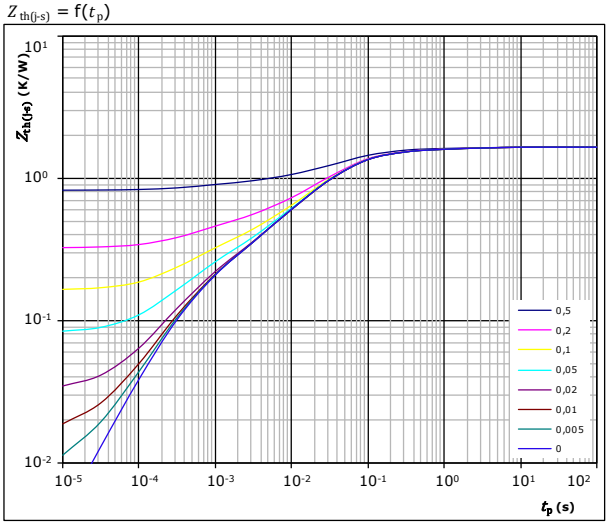
t_p = 250 µs

T_j: 25 °C
150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,63 K/W

FWD thermal model values

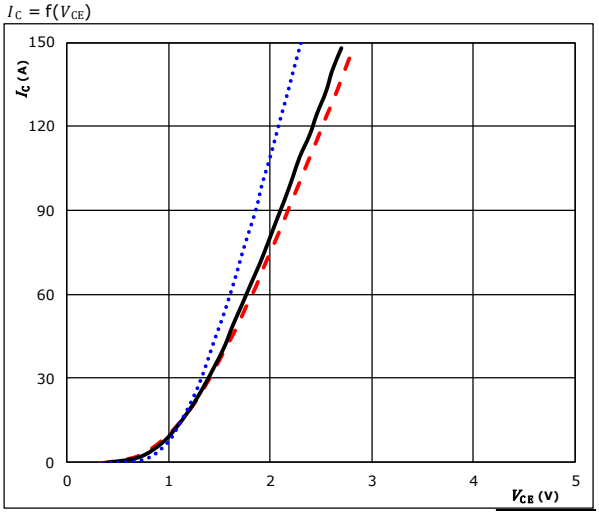
R (K/W)	τ (s)
7,13E-02	2,56E+00
1,55E-01	2,86E-01
7,25E-01	5,21E-02
3,93E-01	1,46E-02
1,57E-01	2,62E-03
1,32E-01	3,83E-04

PFC Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

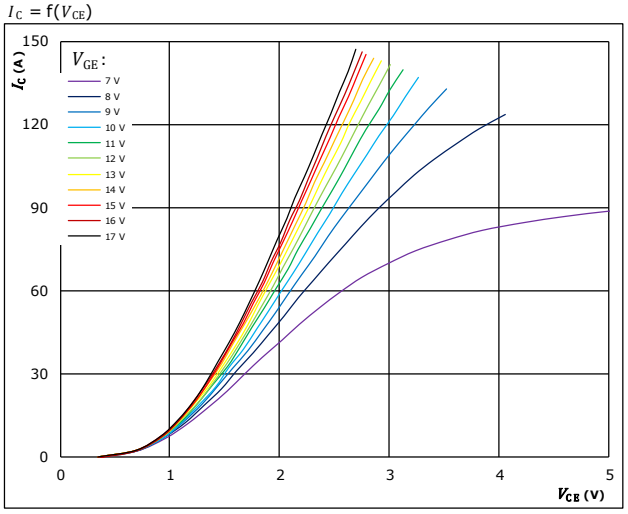


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

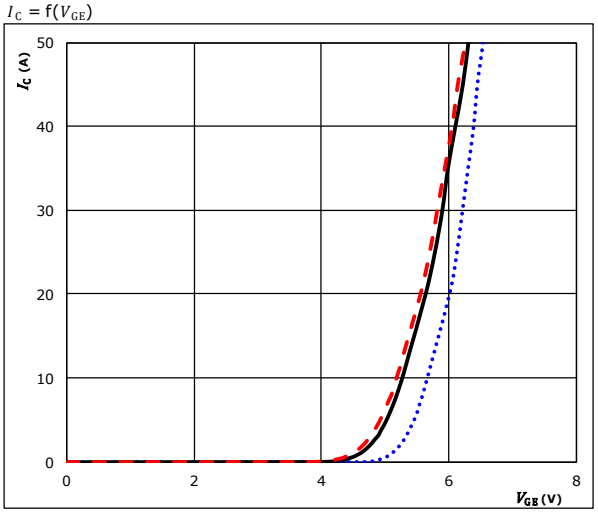


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

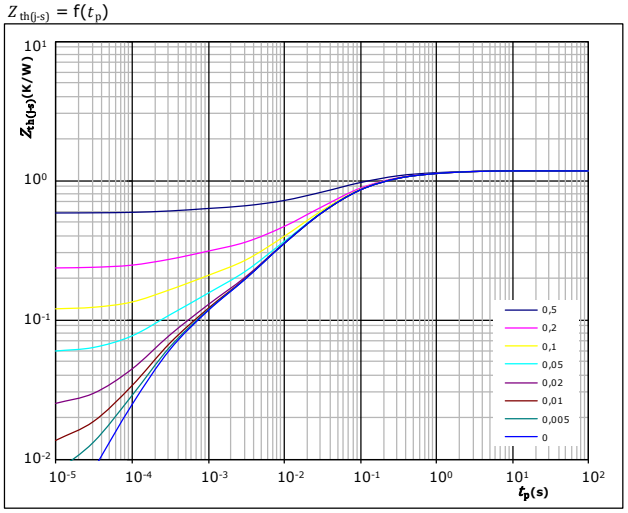


t_p =	100	µs		25 °C
V_{CE} =	3634	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,17	K/W

IGBT thermal model values

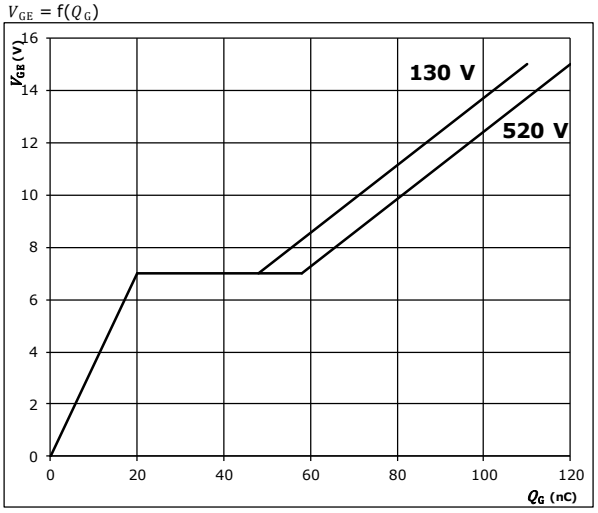
R (K/W)	τ (s)
9,21E-02	1,46E+00
2,50E-01	2,13E-01
4,87E-01	5,11E-02
2,29E-01	1,02E-02
4,67E-02	1,93E-03
6,92E-02	3,04E-04

PFC Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

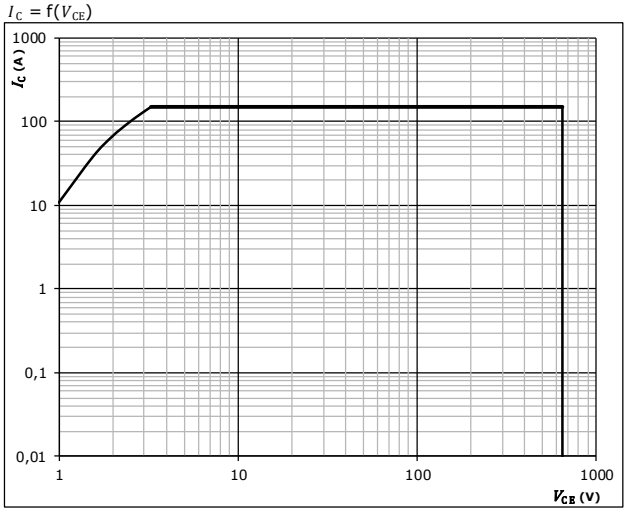


I_C = 50 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



D = single pulse

T_s = 80 °C

V_{GE} = ±15 V

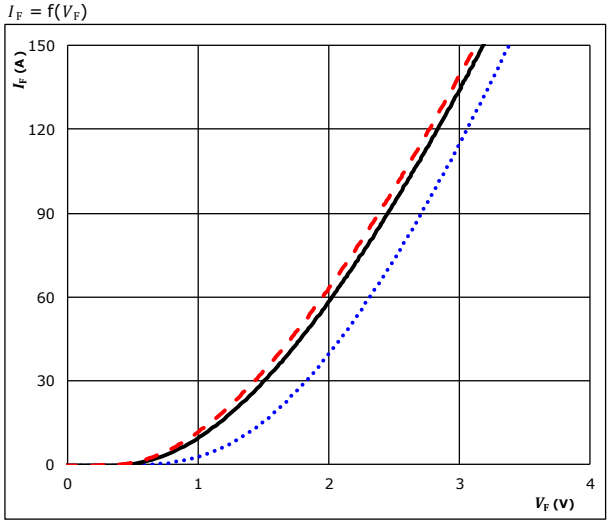
T_j = T_{jmax}

PFC Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



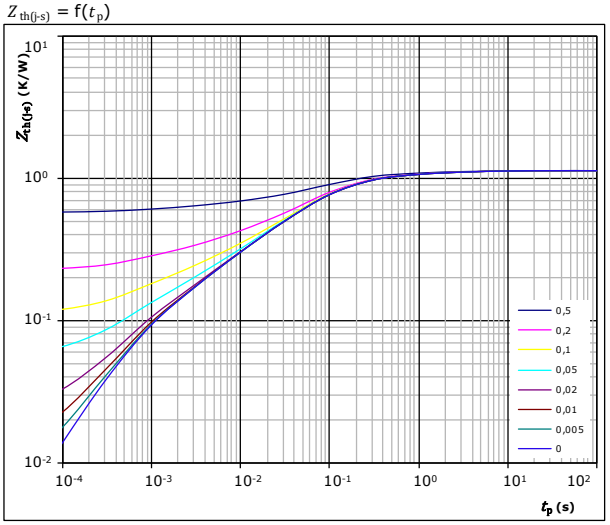
t_p = 250 µs

T_j: 25 °C
125 °C
150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,14 K/W

FWD thermal model values

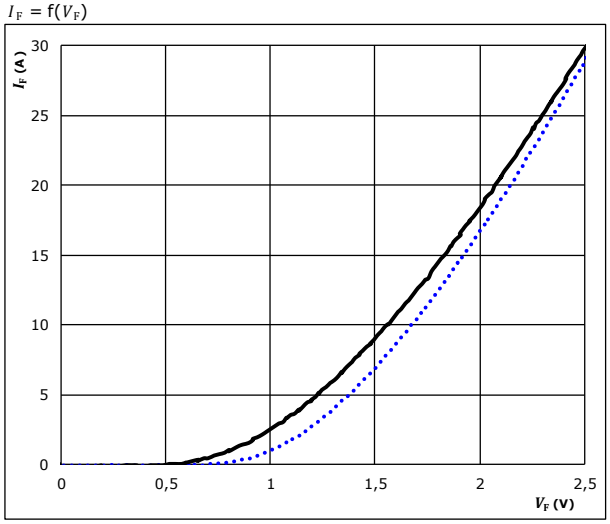
R (K/W)	τ (s)
4,89E-02	4,95E+00
1,50E-01	5,95E-01
4,68E-01	1,06E-01
2,69E-01	3,10E-02
1,24E-01	5,12E-03
7,64E-02	7,25E-04

PFC Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



t_p = 250 µs

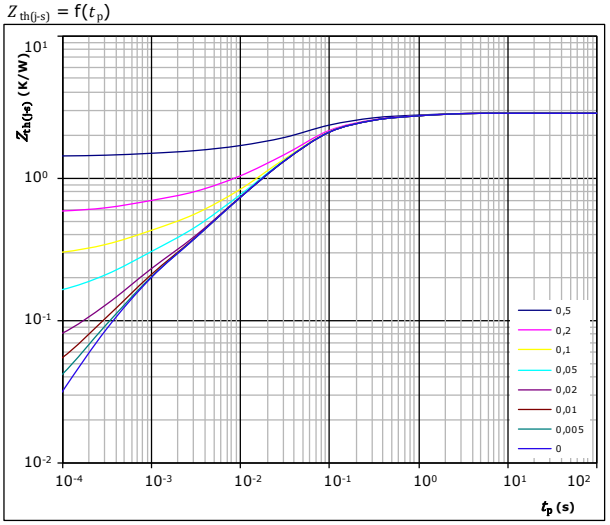
T_j: 25 °C

125 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,87 K/W

FWD thermal model values

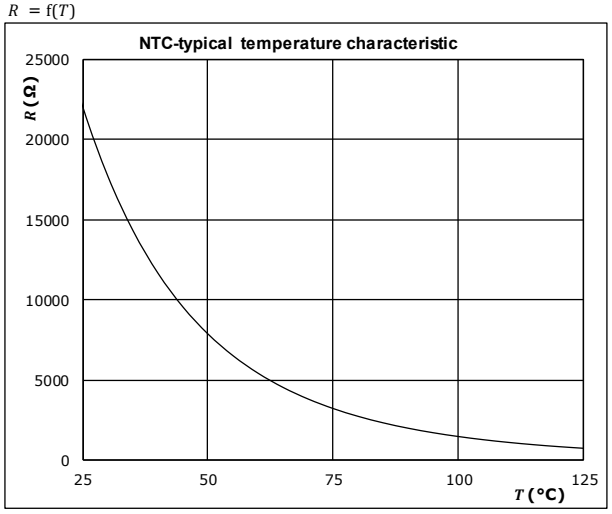
R (K/W)	τ (s)
2,86E-01	2,80E+00
5,75E-01	4,47E-01
1,57E+00	1,18E-01
3,05E-01	1,46E-02
1,34E-01	1,45E-03

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

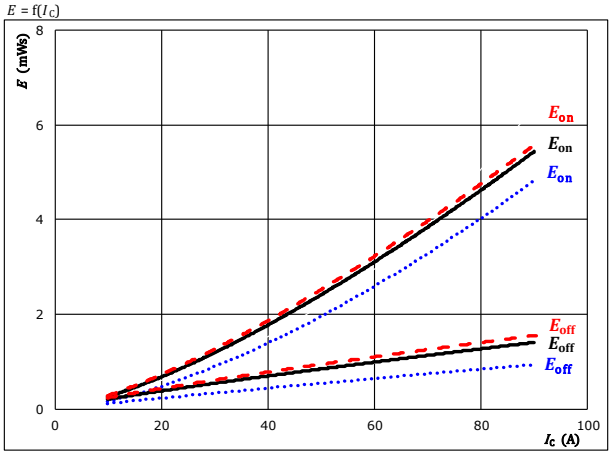


Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



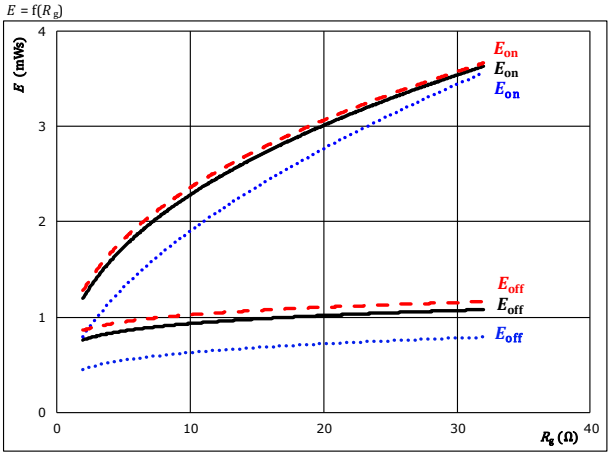
With an inductive load at

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

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



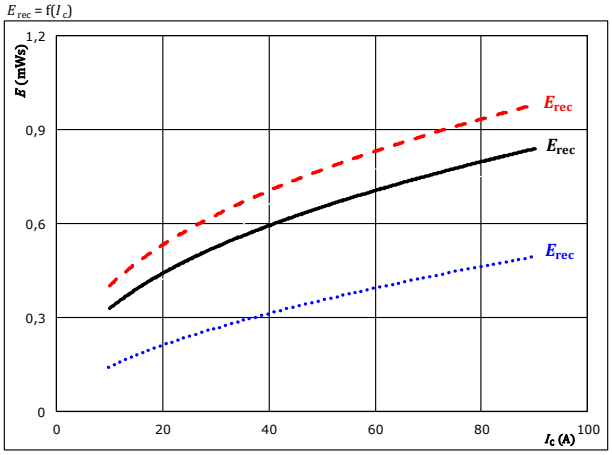
With an inductive load at

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

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



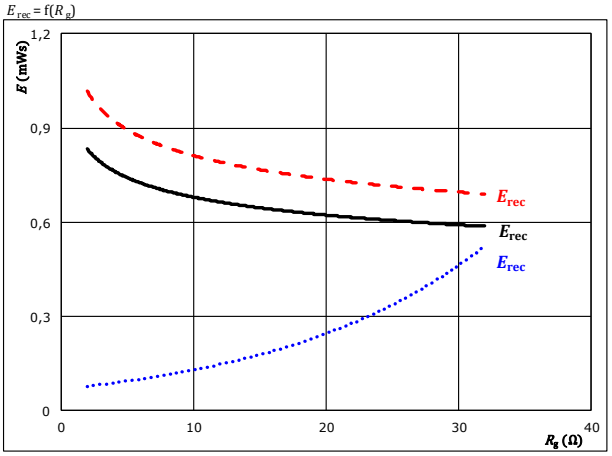
With an inductive load at

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

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

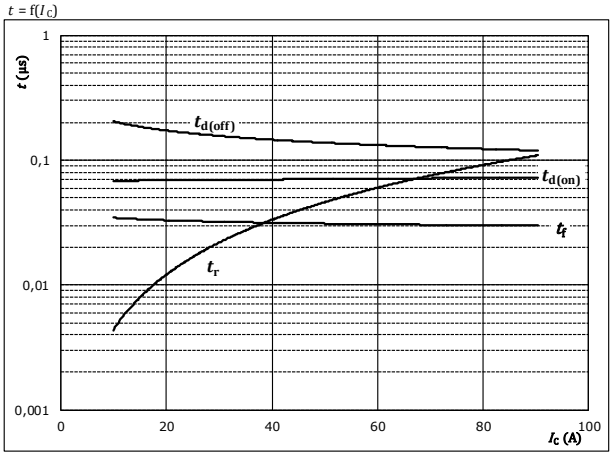
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	50	A		125 °C

Inverter Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



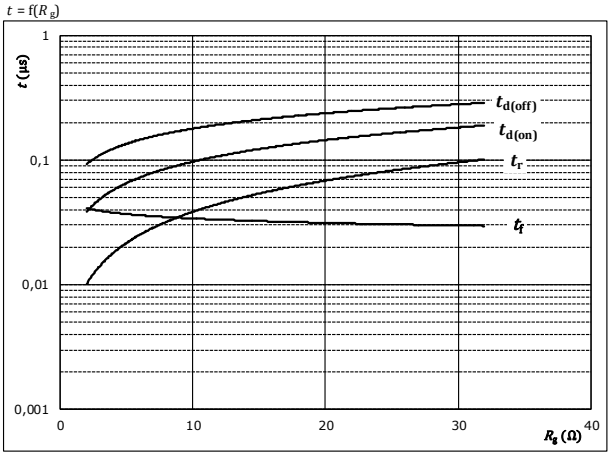
With an inductive load at

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

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



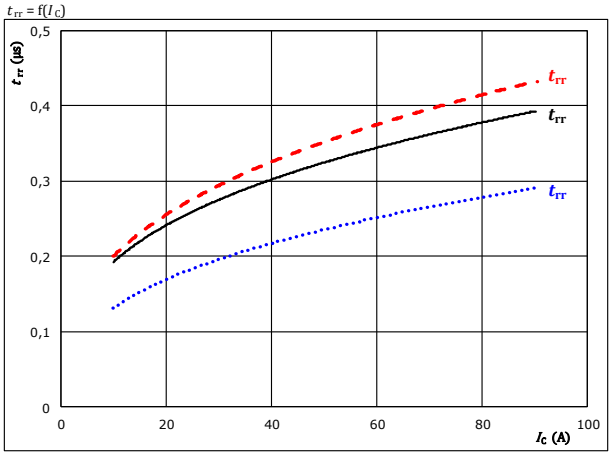
With an inductive load at

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

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

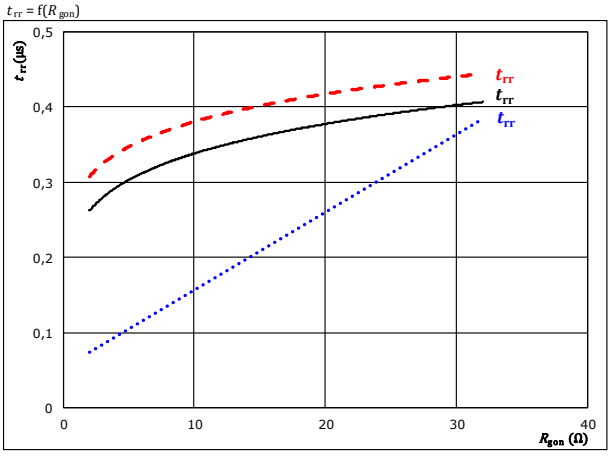
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C, 125 °C

figure 8. **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

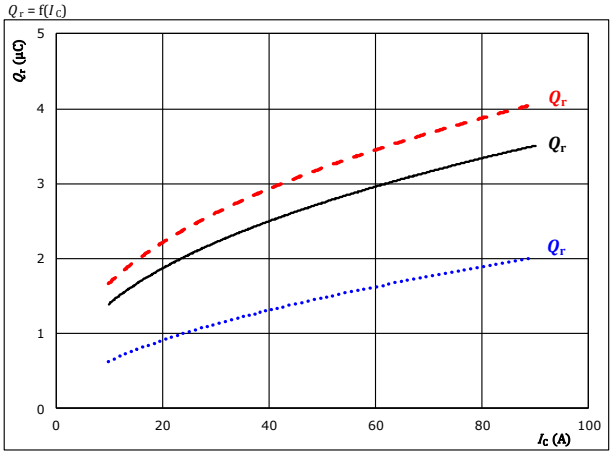
T_j: 25 °C, 125 °C, 125 °C

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



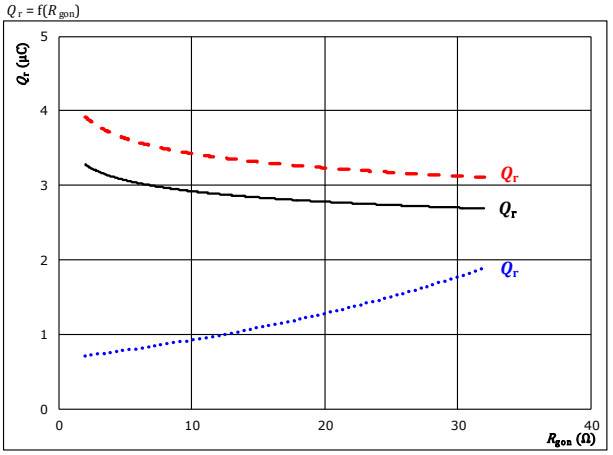
With an inductive load at

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

figure 10. **FWD**

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

$Q_r = f(R_{gon})$



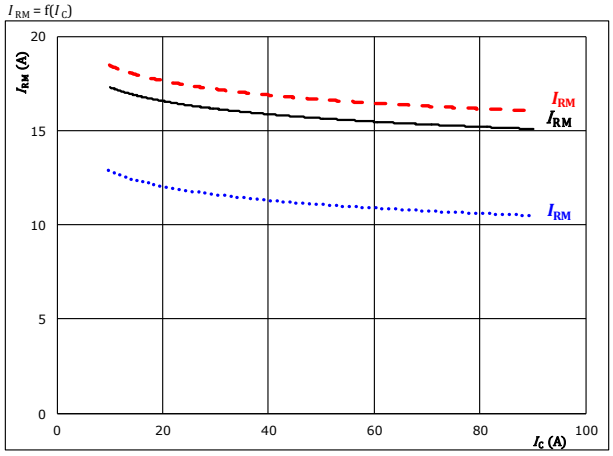
With an inductive load at

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

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$



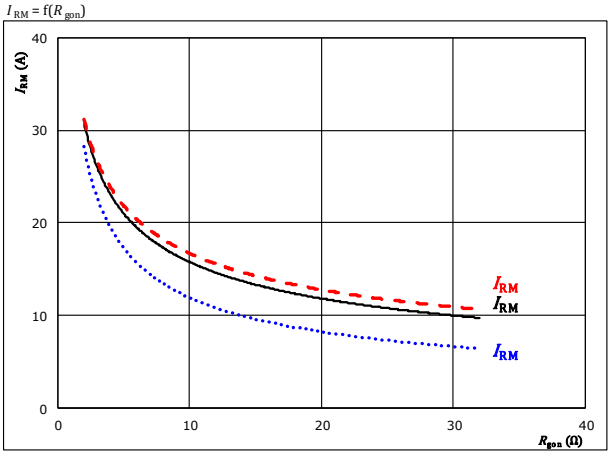
With an inductive load at

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

figure 12. **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

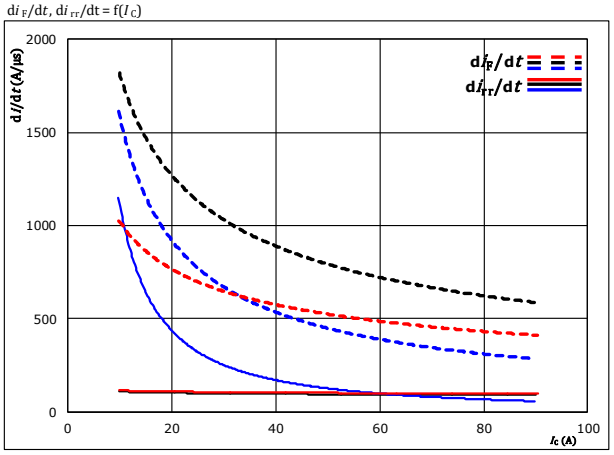
V_{CE} =	350	V	T_j:	25 °C, 125 °C
V_{GE} =	±15	V		125 °C
I_C =	50	A		

Inverter Switching Characteristics

figure 13. **FWD**

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

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



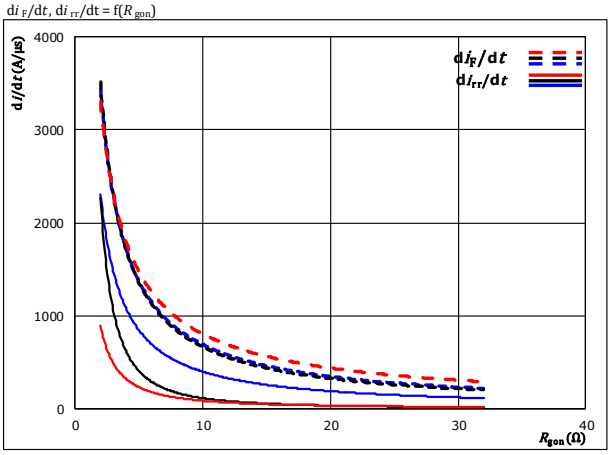
With an inductive load at

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

figure 14. **FWD**

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

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



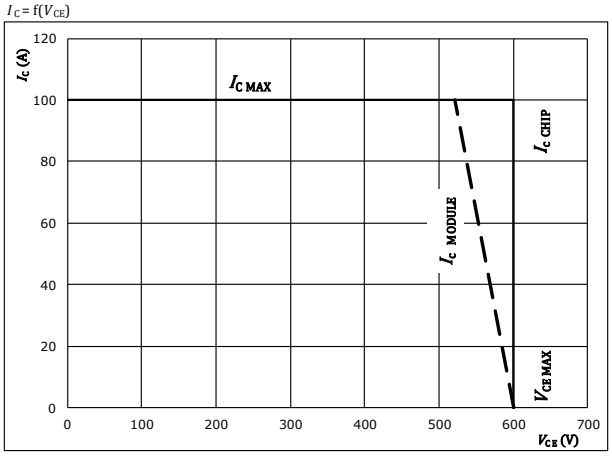
With an inductive load at

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

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	125	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

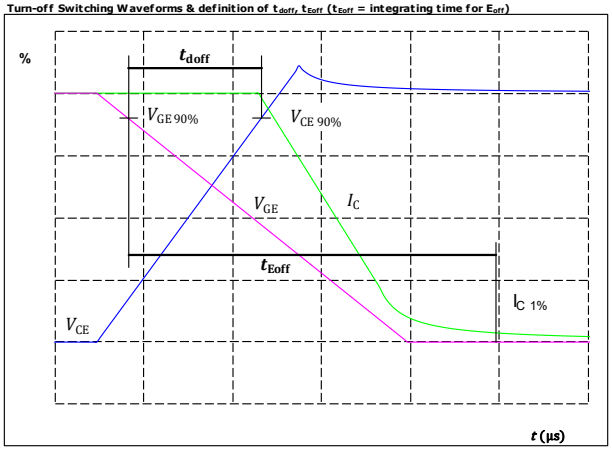
Inverter Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

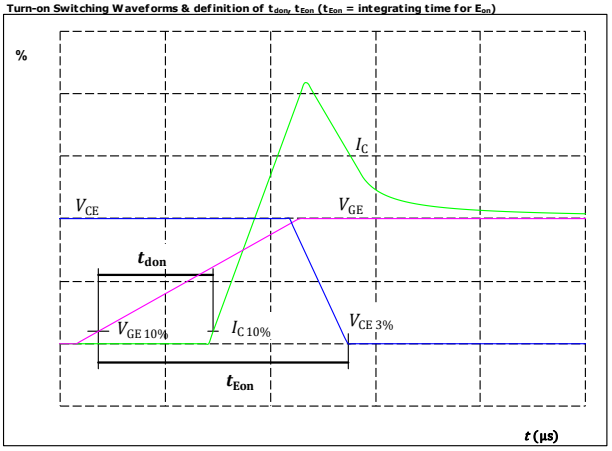
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_{doff} =	134	ns

figure 2. IGBT

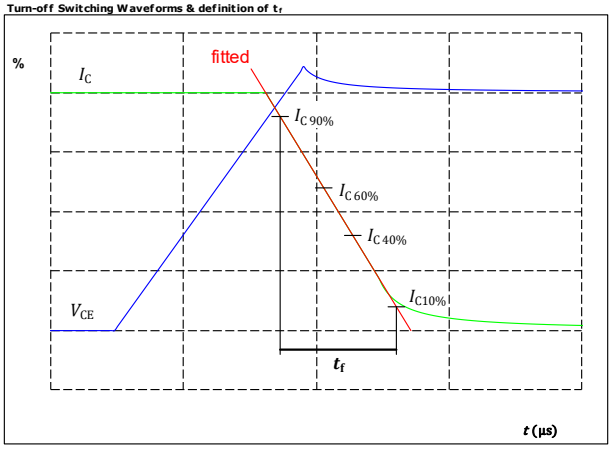
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_{don} =	70	ns

figure 3. IGBT

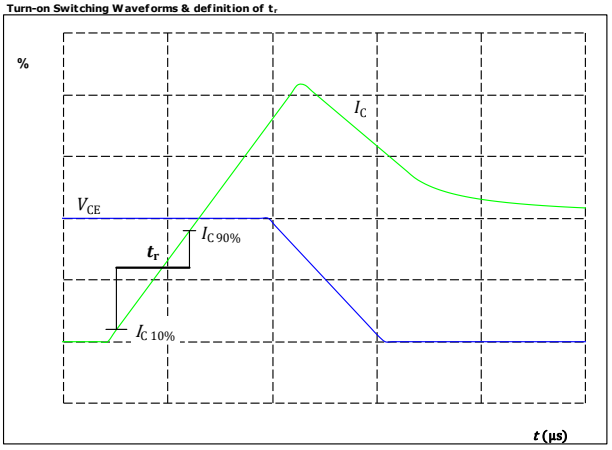
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_f =	34	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

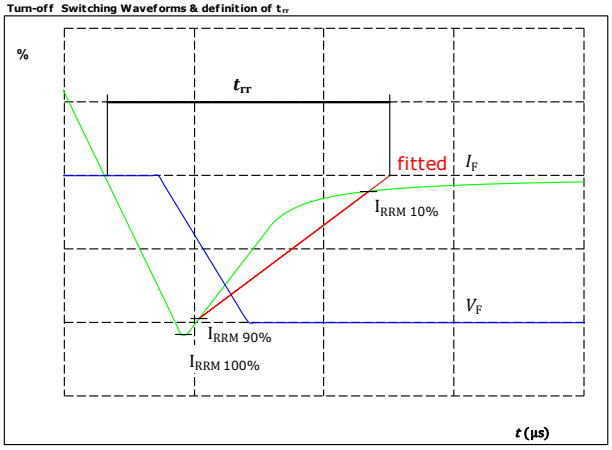


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	50	A
t_r =	43	ns

Inverter Switching Characteristics

figure 5. **FWD**

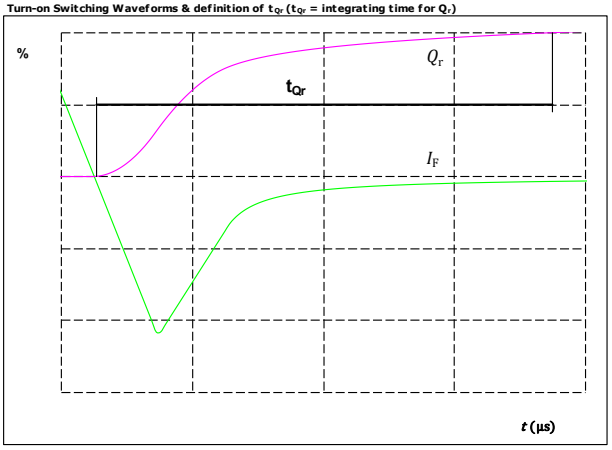
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%)$ =	350	V
$I_F(100\%)$ =	50	A
$I_{RRM}(100\%)$ =	16	A
t_{rr} =	332	ns

figure 6. **FWD**

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



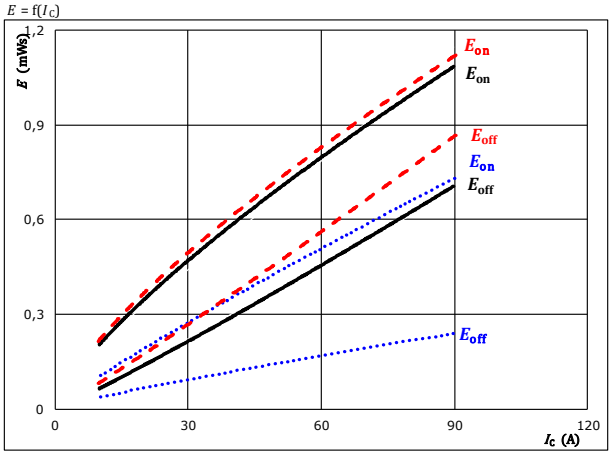
$I_F(100\%)$ =	50	A
$Q_r(100\%)$ =	3,09	µC

PFC Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



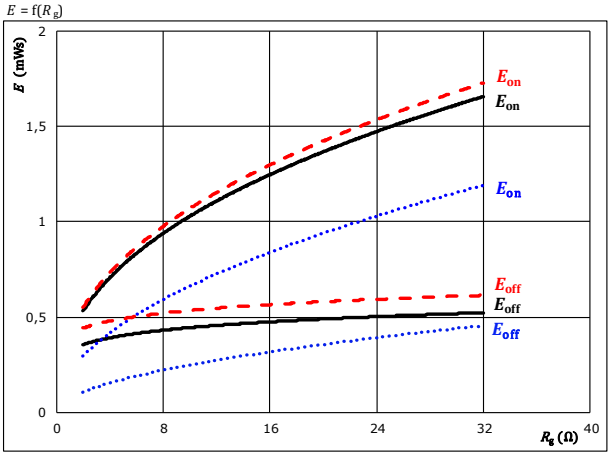
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
R_{gon} =	4	Ω		150 °C
R_{goff} =	4	Ω		

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



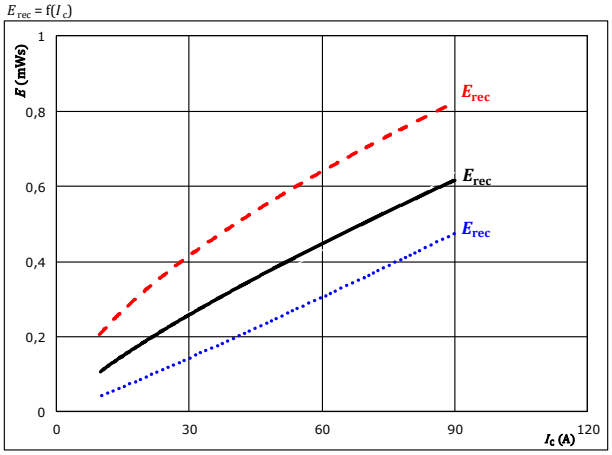
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	50	A		150 °C

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



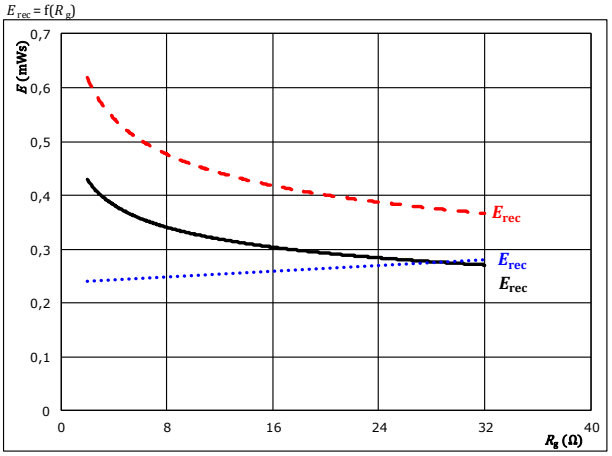
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

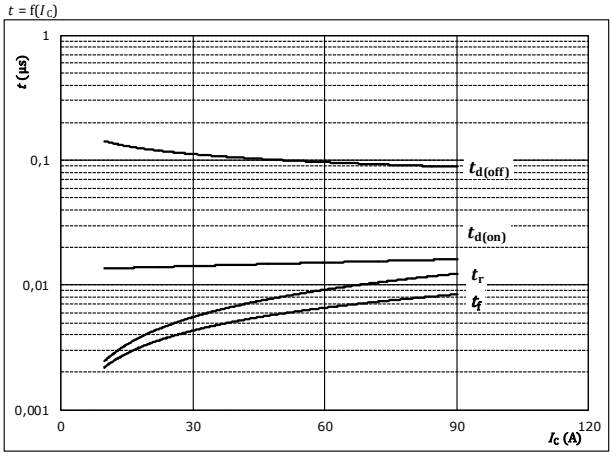
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	50	A		150 °C

PFC Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



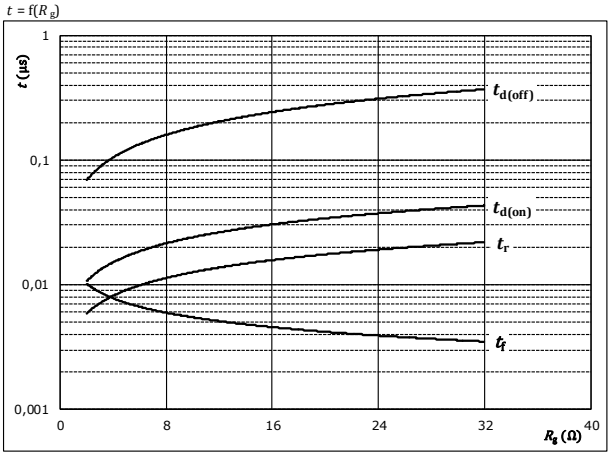
With an inductive load at

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

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



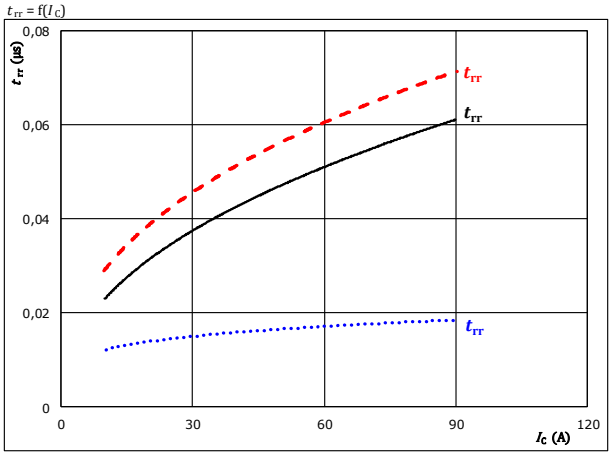
With an inductive load at

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

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



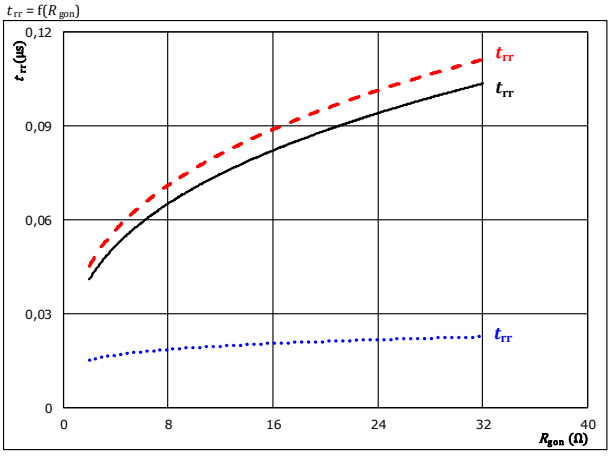
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 8. **FWD**

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

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



With an inductive load at

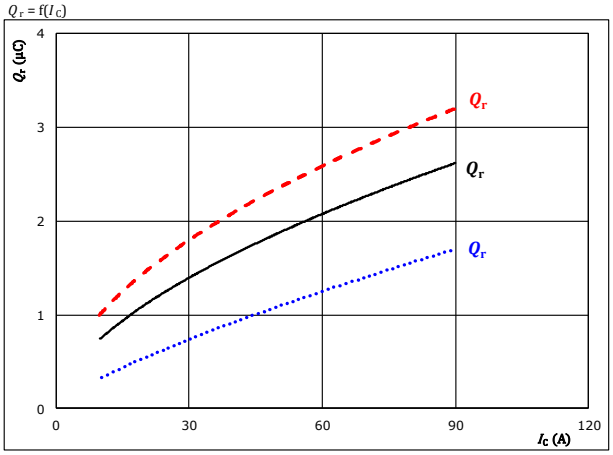
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	50	A		150 °C

PFC Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



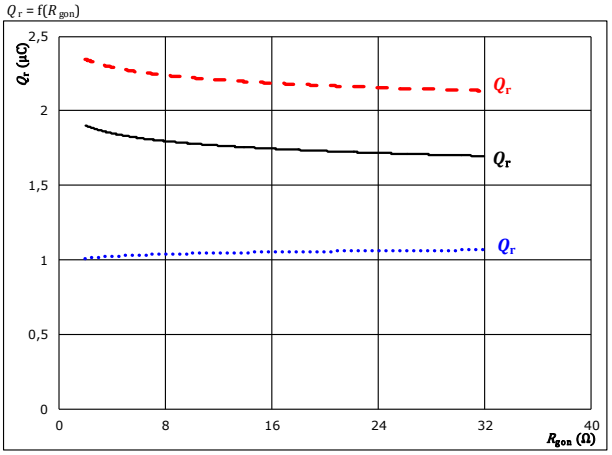
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 10. **FWD**

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

$Q_r = f(R_{gon})$



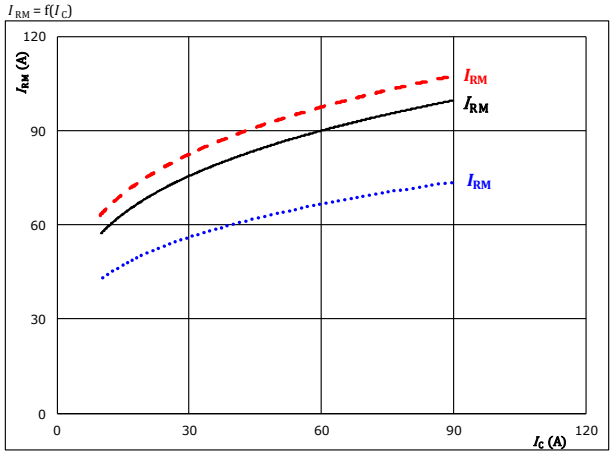
With an inductive load at

V_{CE}=	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C=	50	A		150 °C

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$



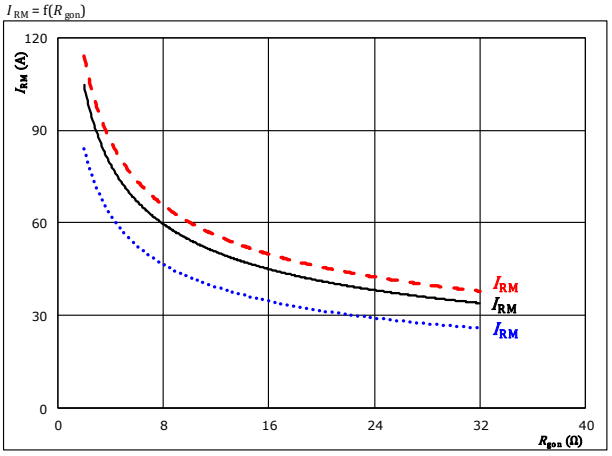
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 12. **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

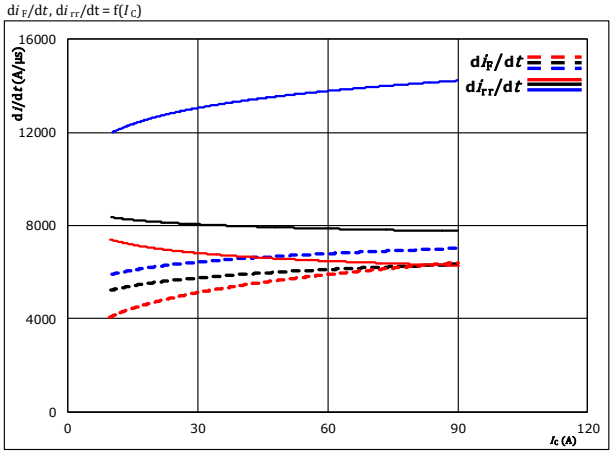
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	50	A		150 °C

PFC Switching Characteristics

figure 13. **FWD**

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

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



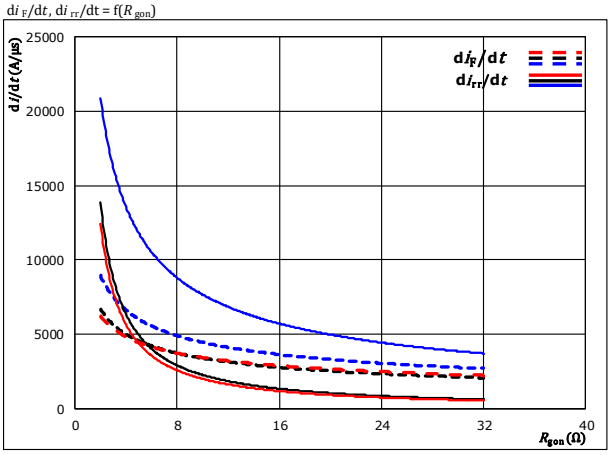
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 14. **FWD**

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

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



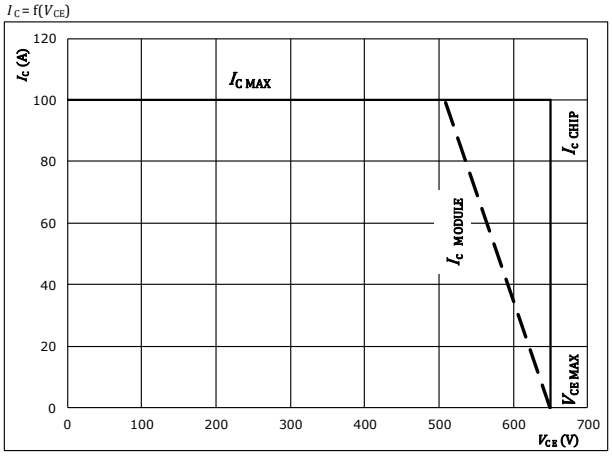
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	50	A		150 °C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

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

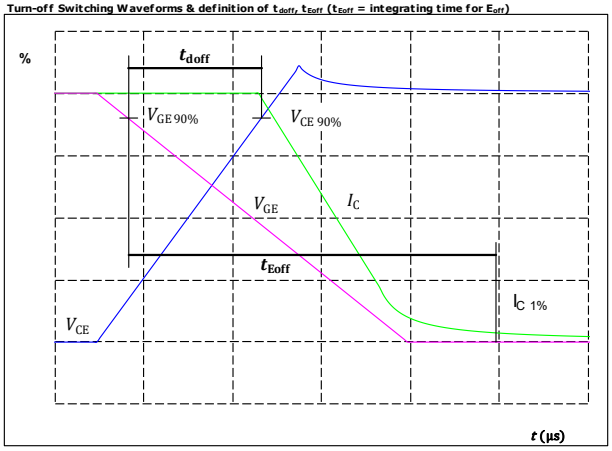
PFC Switching Definitions

General conditions

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

figure 1. IGBT

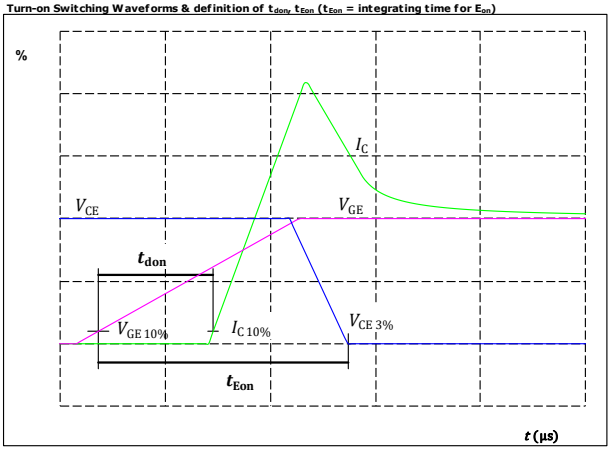
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	50	A
t_{doff} =	97	ns

figure 2. IGBT

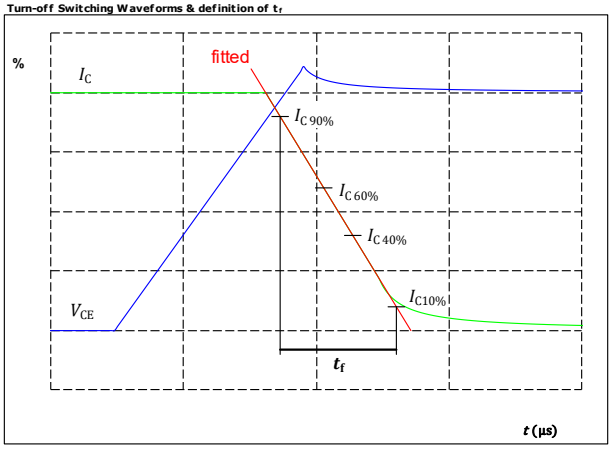
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	50	A
t_{don} =	13	ns

figure 3. IGBT

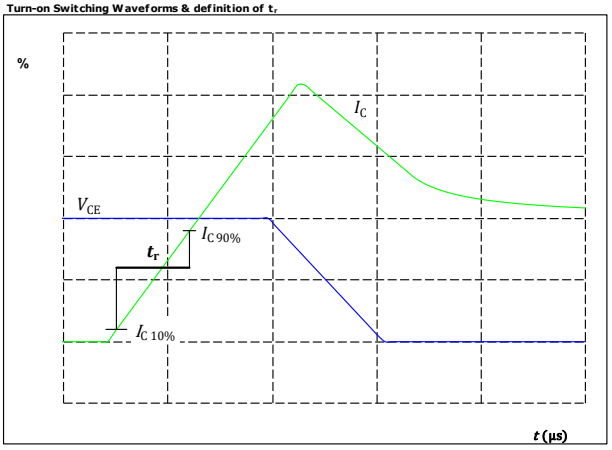
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	50	A
t_f =	6	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

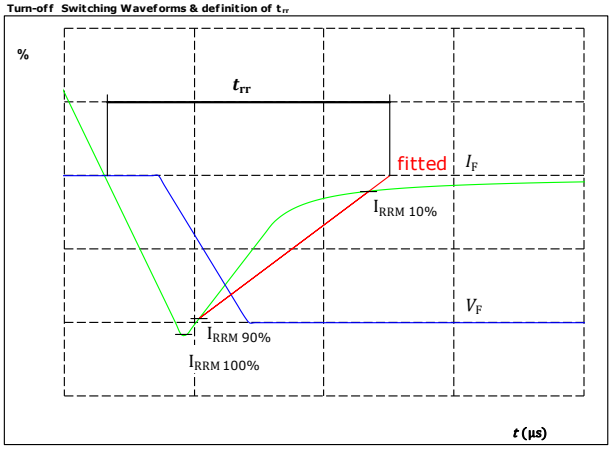


$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	50	A
t_r =	7	ns

PFC Switching Characteristics

figure 5. **FWD**

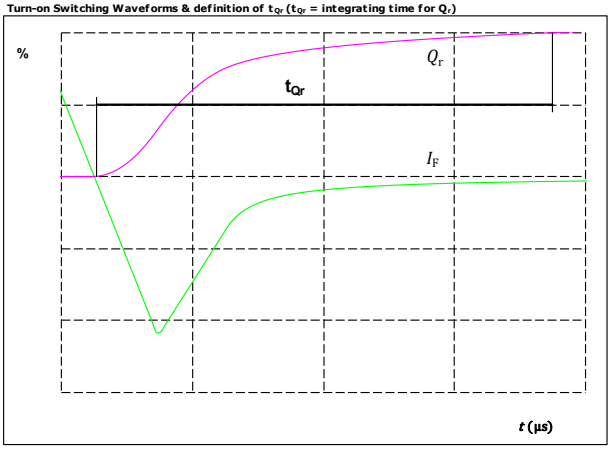
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%)$ =	400	V
$I_F(100\%)$ =	50	A
$I_{RRM}(100\%)$ =	83	A
t_{rr} =	47	ns

figure 6. **FWD**

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



$I_F(100\%)$ =	50	A
$Q_r(100\%)$ =	1,79	µC

Vincotech

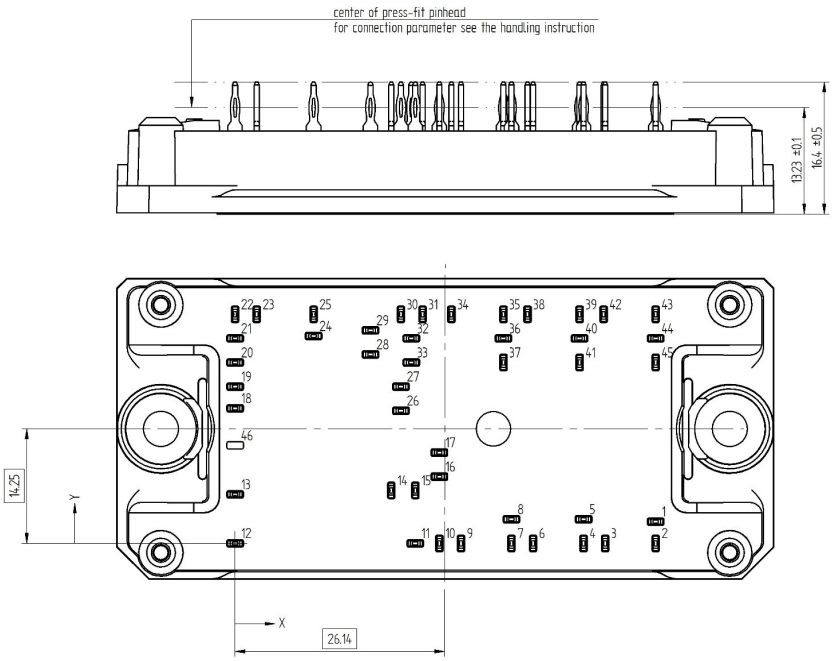
Ordering Code & Marking

Version	Ordering Code
without thermal paste 12mm housing with Press-fit pins	10-PG06PPA050SJ01-LH54E08T
with thermal paste 12mm housing with Press-fit pins	10-PG06PPA050SJ01-LH54E08T-/3/

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

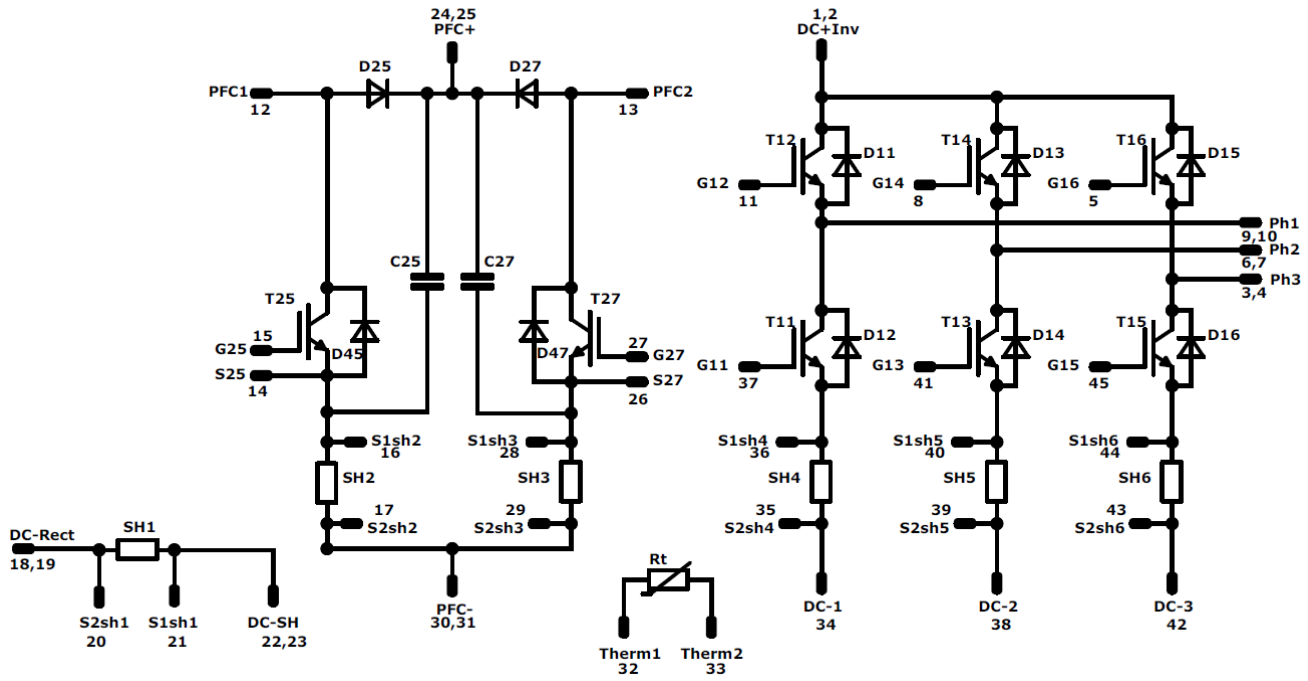
Outline

Pin table			
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	650 V	50 A	PFC Diode	
D45, D47	FWD	650 V	10 A	PFC Sw. Protection Diode	
SH1	Shunt		63 A	Shunt	
SH2, SH3	Shunt		32 A	PFC Shunt	
SH4, SH5, SH6	Shunt		32 A	Inverter Shunt	
C25, C27	Capacitor	630 V		Capacitor (PFC)	
Rt	NTC			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.

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-PG06PPA050SJ01-LH54E08T-D3-14	09 May. 2019	Correction of I_c/I_f values	2