Vincotech

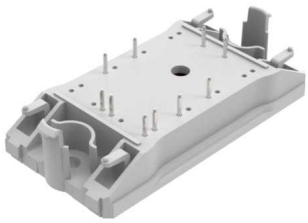
10-FZ07LBA100SM01-L705L18
datasheet

flow NPFC 0	650 V / 100 A

Features

- Three-phase NPFC topology
- High efficient IGBT H5 technology
- Low inductive design
- Integrated Thermistor

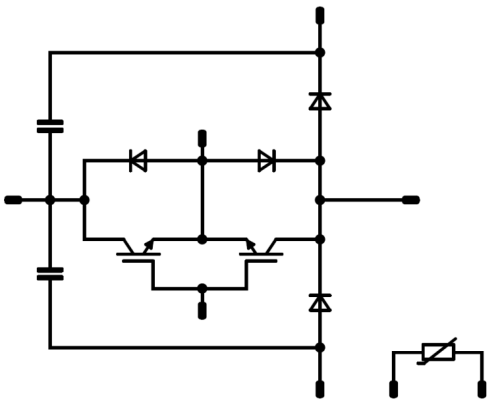
flow 0 12 mm housing



Target applications

- Power Supply
- UPS

Schematic



Types

- 10-FZ07LBA100SM01-L705L18

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	79	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	133	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	Condition	Value	Unit
Boost Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	66	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	122	W
Maximum Junction Temperature	T_{jmax}		175	°C
Buck Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	85	A
Repetitive peak forward current	I_{FRM}		200	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	122	W
Maximum Junction Temperature	T_{jmax}		175	°C
Capacitor (DC)				
Maximum DC voltage	V_{MAX}		500	V
Operation Temperature	T_{op}		-55…+125	°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			9,15	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	
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,001	25	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 125		1,63 1,78	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25			80	µA
Gate-emitter leakage current	I_{GES}		20	0		25			240	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 MHz	0	25		25		6000		pF
Output capacitance	C_{oes}							100		
Reverse transfer capacitance	C_{res}							22		
Gate charge	Q_g		15	520	100	25		240		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,72		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	15/-5	350	80	25 125 150		74 72 70		ns
Rise time	t_r					25 125 150		20 22 22		
Turn-off delay time	$t_{d(off)}$					25 125 150		162 176 180		
Fall time	t_f					25 125 150		6 10 9		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 4,9 µC Q_{rFWD} = 10 µC Q_{rFWD} = 12,4 µC				25 125 150		2,749 3,595 3,926		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,297 0,515 0,594		

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	
Boost Diode										
Static										
Forward voltage	V_F				100	25 125 150		2,50 2,46 2,37	2,60	V
Reverse leakage current	I_r			1200		25 150			120 17700	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,78		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 4646 A/µs di/dt = 3416 A/µs di/dt = 3473 A/µs	15/-5	350	80	25 125 150		79 106 117		A
Reverse recovery time	t_{rr}					25 125 150		119 219 243		ns
Recovered charge	Q_r					25 125 150		4,918 10,042 12,437		µC
Reverse recovered energy	E_{rec}					25 125 150		0,890 2,190 2,784		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3514 3663 3540		A/µs
Buck Diode										
Static										
Forward voltage	V_F				100	25 150		1,77 1,57	1,82	V
Reverse leakage current	I_r			650		25			1,2	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,78		K/W
Capacitor (DC)										
Capacitance	C							150		nF
Tolerance							-10		+10	%
Dissipation factor		f = 1 kHz				25			2,5	%
Climatic category							55/125/56			

Characteristic Values

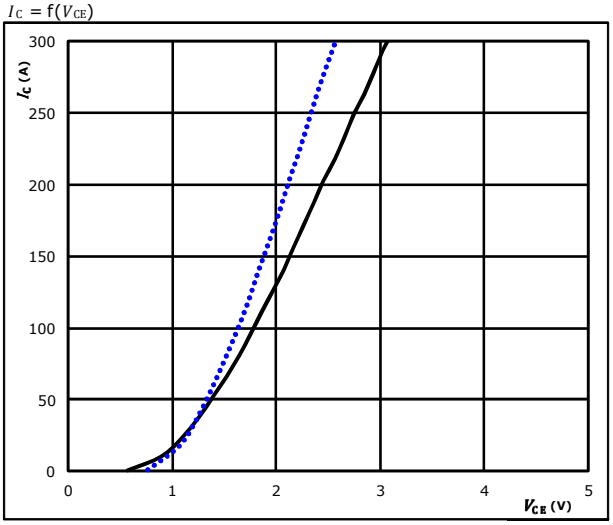
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-12		+14	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		3998		K
Vincotech NTC Reference									B	

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

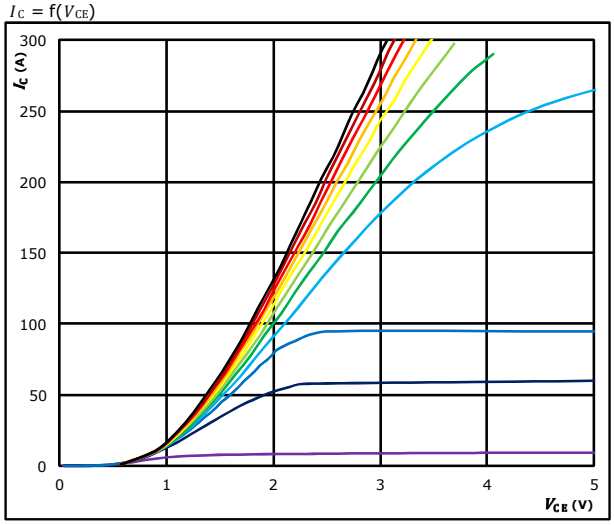


t_p =	250	µs		25 °C	
V_{GE} =	15	V	T_j:	125 °C	

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

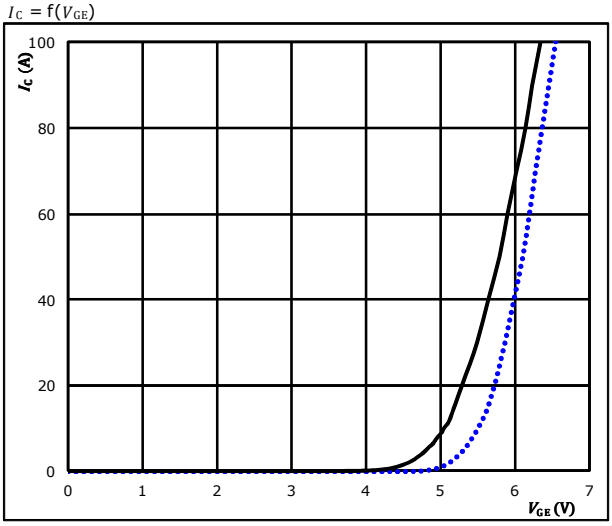


t_p =	250	µs
T_j =	125	°C
V_{GE} from	5 V to 19 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

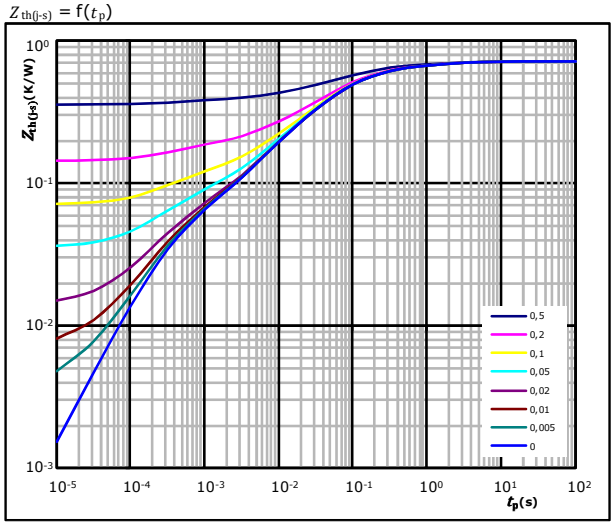


t_p =	100	µs		25 °C	
V_{CE} =	10	V	T_j:	125 °C	

figure 4. **IGBT**

Transient Thermal Impedance as function of Pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,72	K/W

IGBT thermal model values

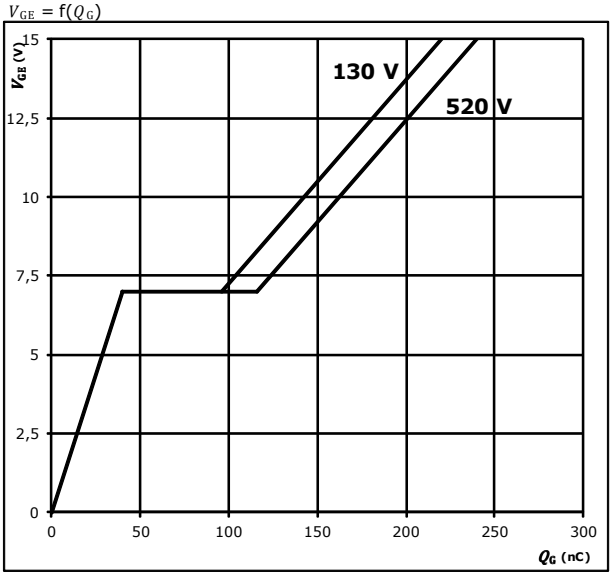
R (K/W)	τ (s)
7,52E-02	1,73E+00
1,31E-01	2,44E-01
3,01E-01	6,32E-02
1,21E-01	1,39E-02
4,30E-02	3,50E-03
4,35E-02	3,33E-04

Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_G)$



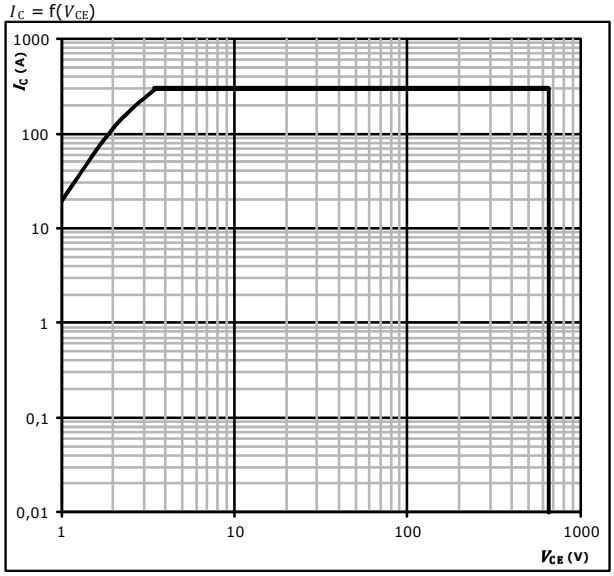
At

I_C= 100 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



At

D = single pulse

T_s = 80 °C

V_{GE} = ±15 V

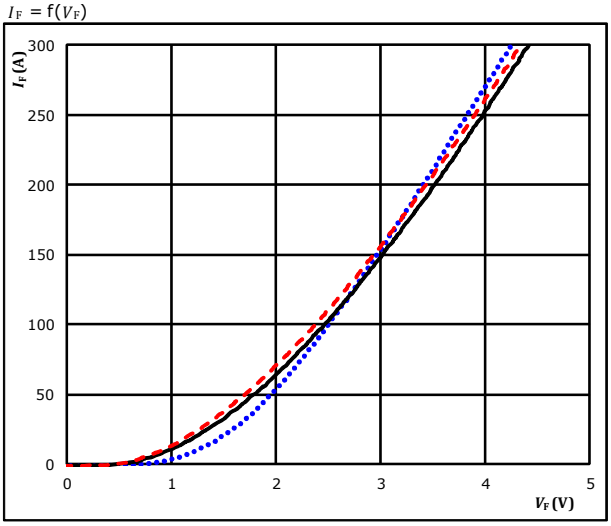
T_j = T_{jmax}

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



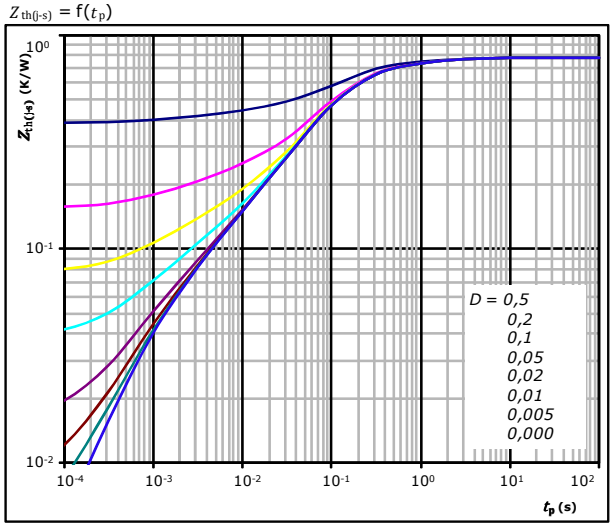
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,78 K/W

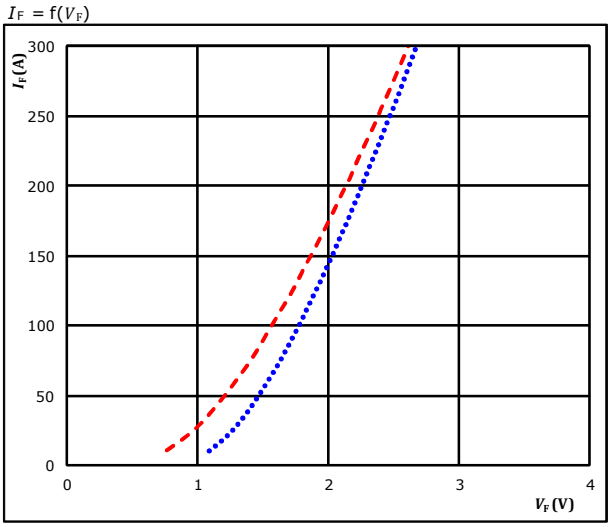
FWD thermal model values

R (K/W)	τ (s)
7,81E-02	1,59E+00
1,93E-01	2,55E-01
3,99E-01	7,68E-02
7,07E-02	6,98E-03
3,88E-02	9,88E-04

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

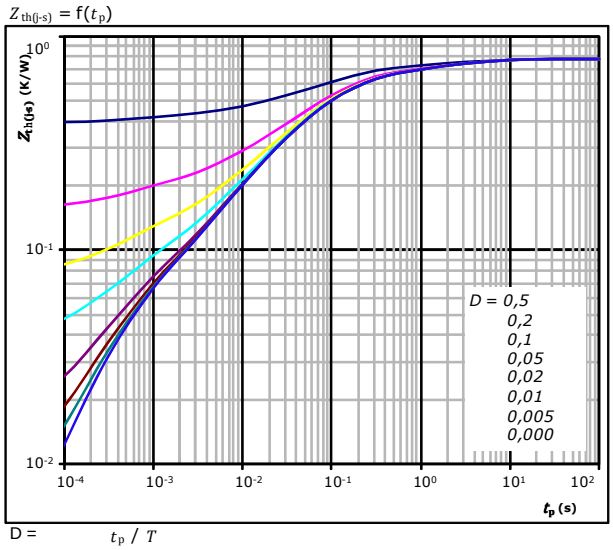


t_p = 250 µs

T_j: 25 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width



D = t_p / T

$R_{th(j-s)}$ = 0,78 K/W

FWD thermal model values

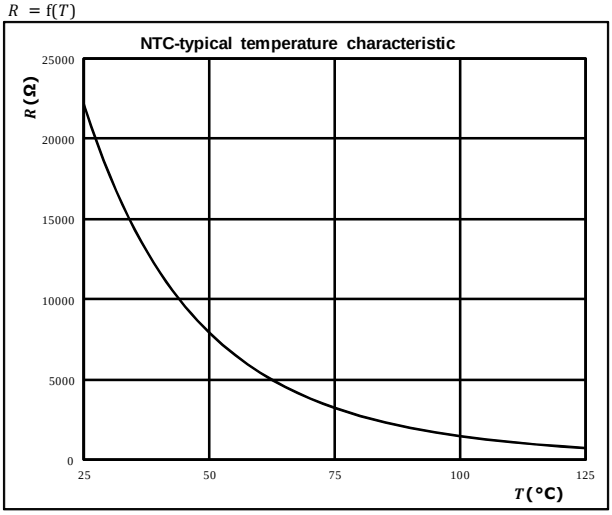
R (K/W)	τ (s)
5,76E-02	5,42E+00
8,79E-02	1,09E+00
2,14E-01	1,59E-01
2,31E-01	4,95E-02
1,16E-01	1,05E-02
3,20E-02	2,39E-03
4,19E-02	4,10E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

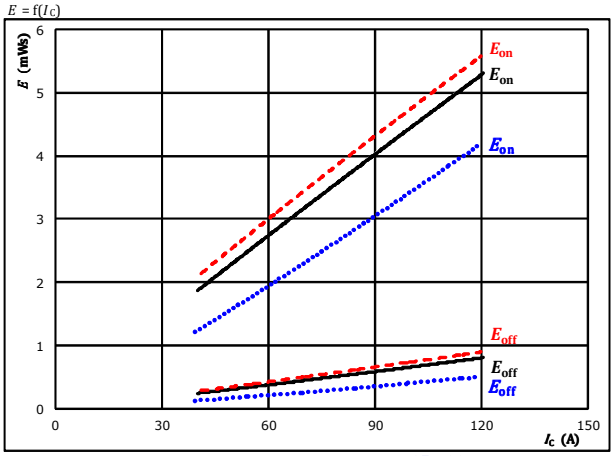


Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



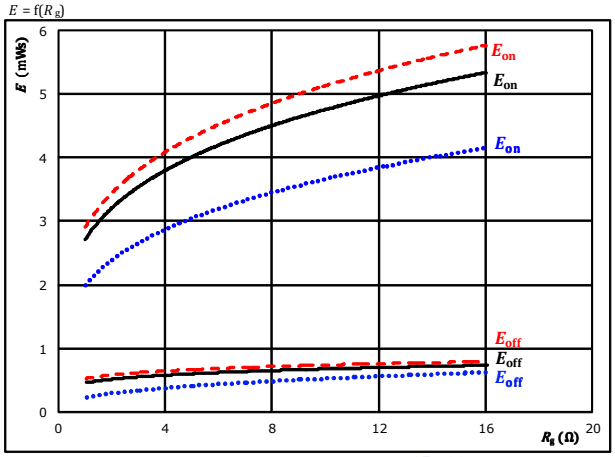
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	
V_{GE} =	15/-5	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

$E = f(R_g)$



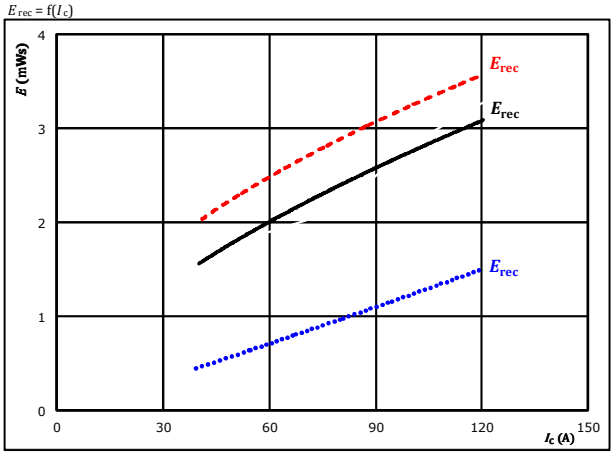
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	
V_{GE} =	15/-5	V		125 °C	
I_C =	80	A		150 °C	

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



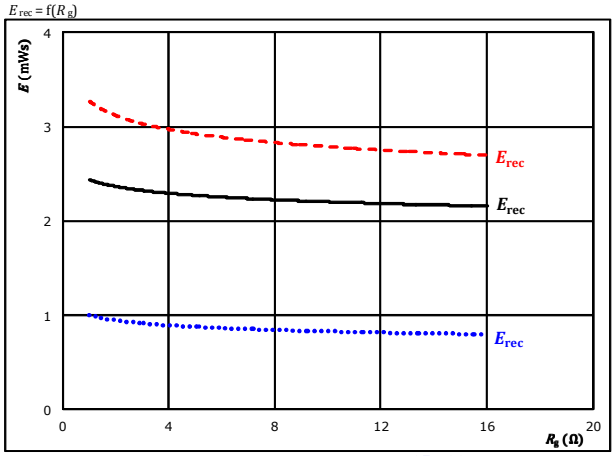
With an inductive load at

V_{CE} =	350	V	T_J:	25 °C	
V_{GE} =	15/-5	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

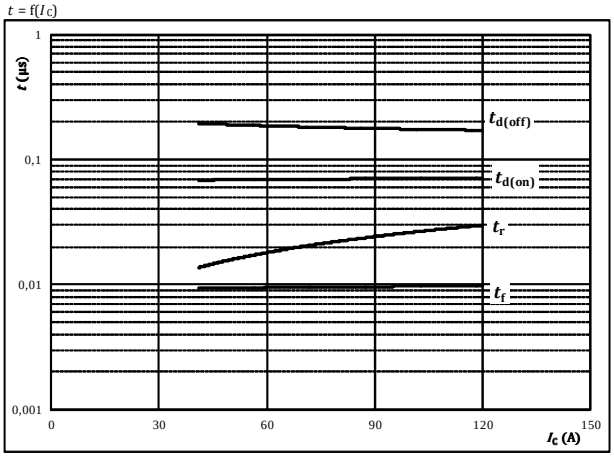
V_{CE} =	350	V	T_J:	25 °C	
V_{GE} =	15/-5	V		125 °C	
I_C =	80	A		150 °C	

Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



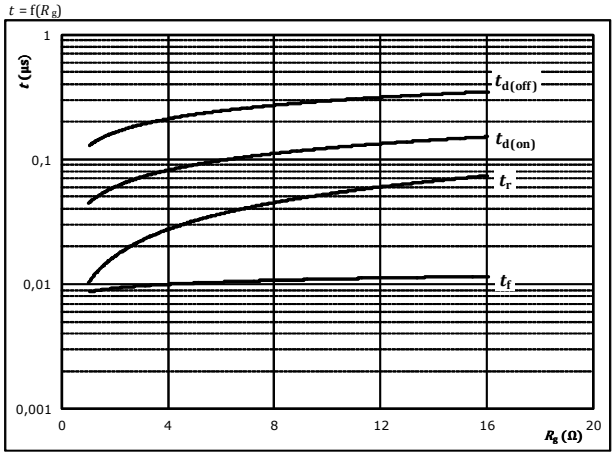
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	15/-5	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



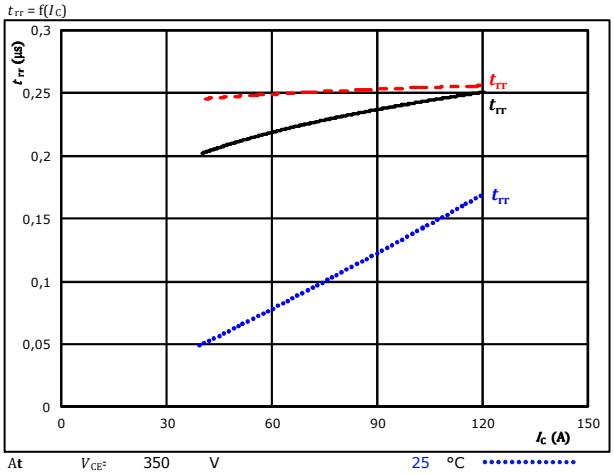
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	15/-5	V
I_C =	80	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

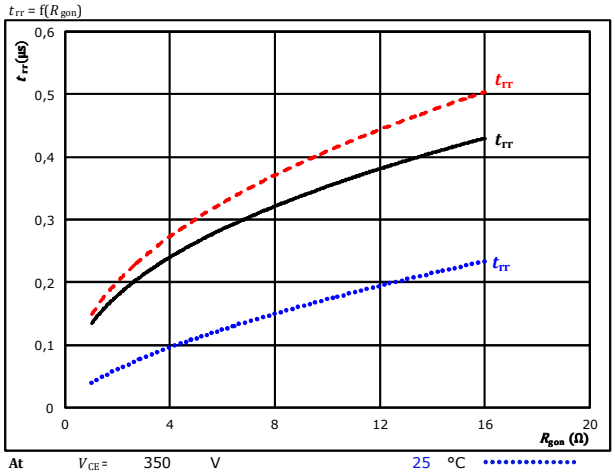


At					
V_{CE} =	350	V	T_j:	25 °C	·····
V_{GE} =	15/-5	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

figure 8. FWD

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

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



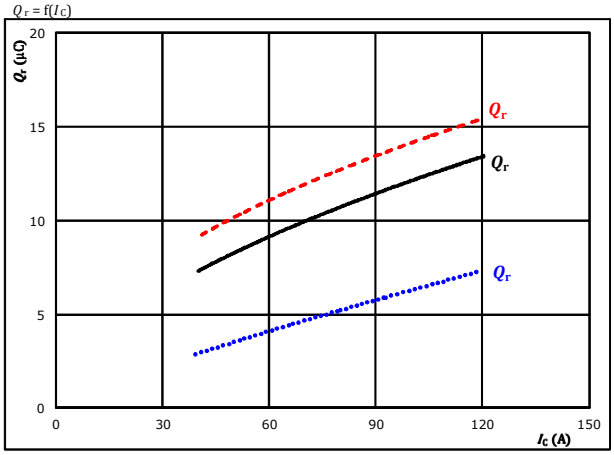
At					
V_{CE} =	350	V	T_j:	25 °C	·····
V_{GE} =	15/-5	V		125 °C	———
I_C =	80	A		150 °C	– – –

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

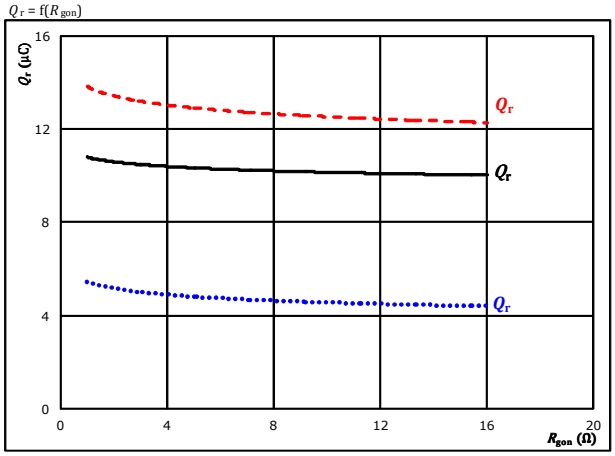


At						
V_{CE} =	350	V		25 °C	•••••••••••••••
V_{GE} =	15/-5	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	– – – –

figure 10. FWD

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

$Q_r = f(R_{gon})$

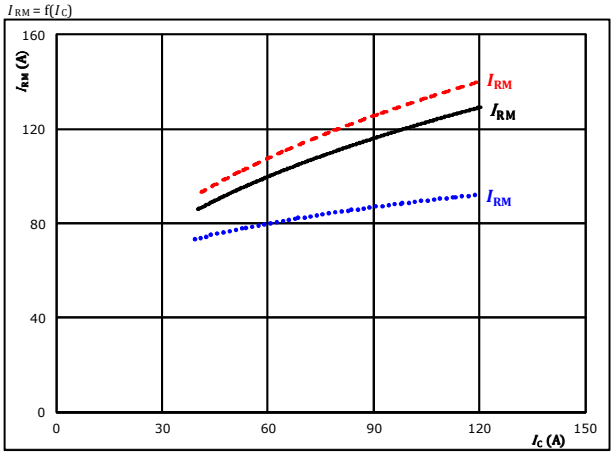


At						
V_{CE}=	350	V		25 °C	•••••••••••••••
V_{GE} =	15/-5	V	T_j:	125 °C	———
I_C=	80	A		150 °C	– – – –

figure 11. FWD

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

$I_{RM} = f(I_C)$

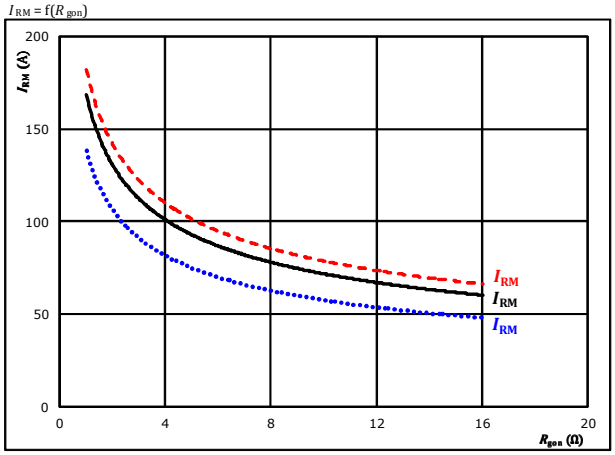


At						
V_{CE}:	350	V		25 °C	•••••••••••••••
V_{GE} =	15/-5	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	– – – –

figure 12. FWD

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

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



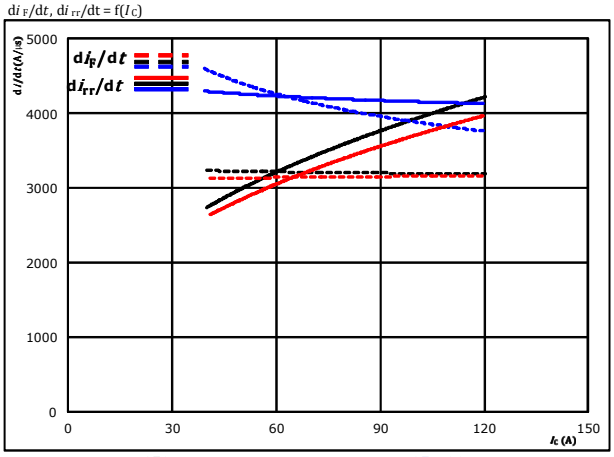
At						
V_{CE} =	350	V		25 °C	•••••••••••••••
V_{GE} =	15/-5	V	T_j:	125 °C	———
I_C =	80	A		150 °C	– – – –

Boost Switching Characteristics

figure 13. **FWD**

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

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

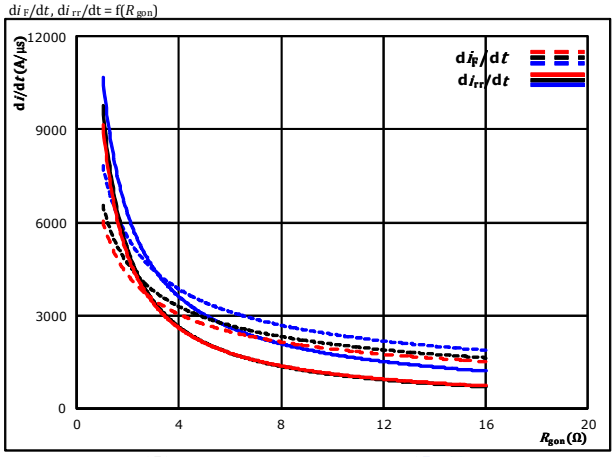


At						
V_{CE} =	350	V		25	°C	•••••••••••••••
V_{GE} =	15/-5	V	T_j:	125	°C	———
R_{gon} =	4	Ω		150	°C	– – – –

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

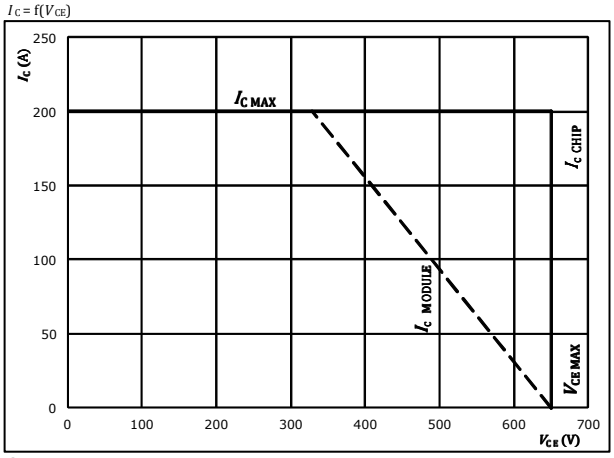


At						
V_{CE} =	350	V		25	°C	•••••••••••••••
V_{GE} =	15/-5	V	T_j:	125	°C	———
I_C =	80	A		150	°C	– – – –

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

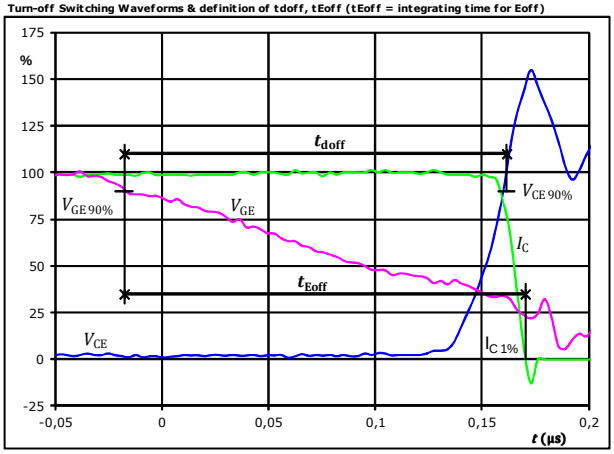
Boost Switching Definitions

General conditions

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

figure 1. **IGBT**

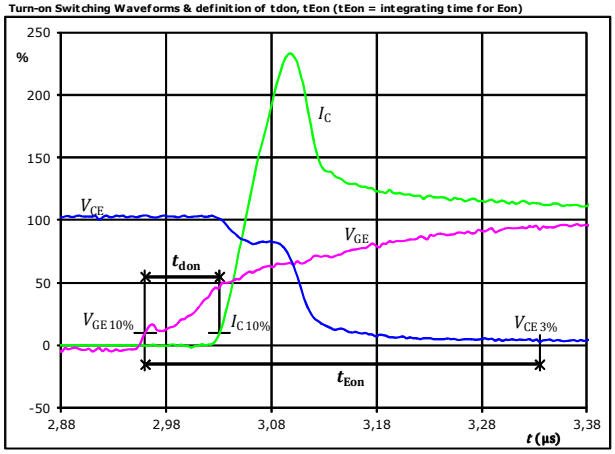
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	80	A
t_{doff} =	0,176	µs
t_{Eoff} =	0,188	µs

figure 2. **IGBT**

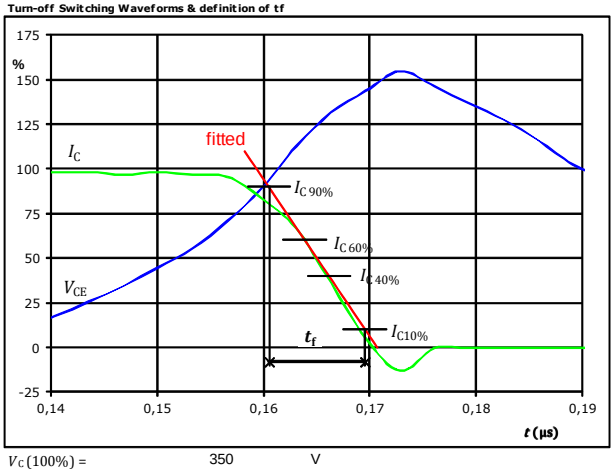
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	80	A
t_{don} =	0,072	µs
t_{Eon} =	0,375	µs

figure 3. **IGBT**

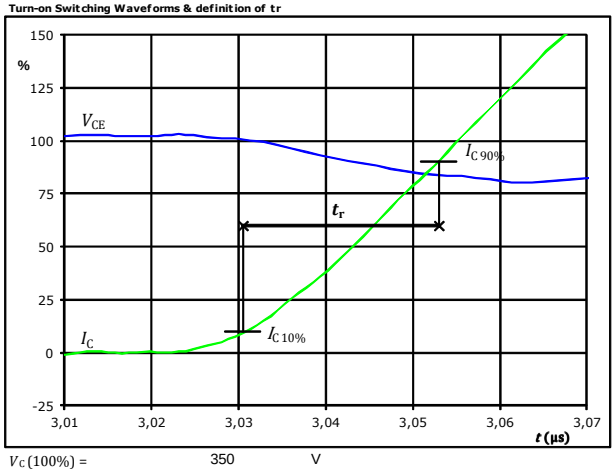
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	80	A
t_f =	0,009	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

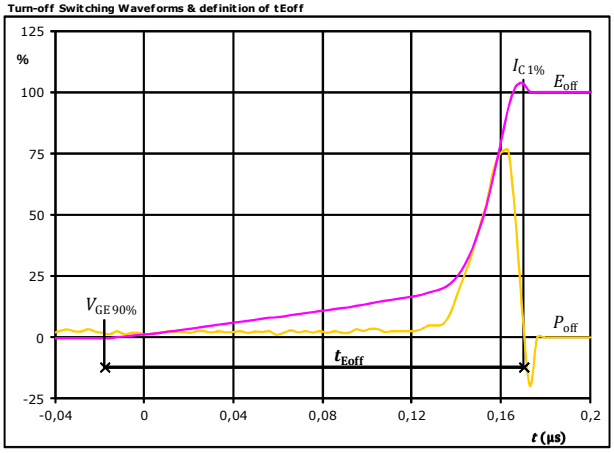


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	80	A
t_r =	0,022	µs

Boost Switching Characteristics

figure 5. **IGBT**

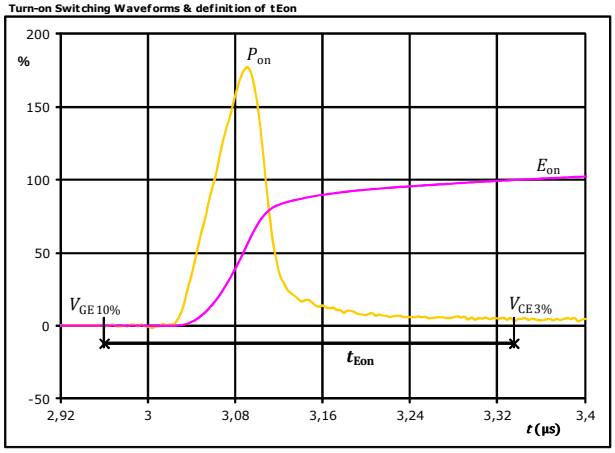
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	27,98	kW
$E_{off}(100\%)$ =	0,52	mJ
t_{Eoff} =	0,19	µs

figure 6. **IGBT**

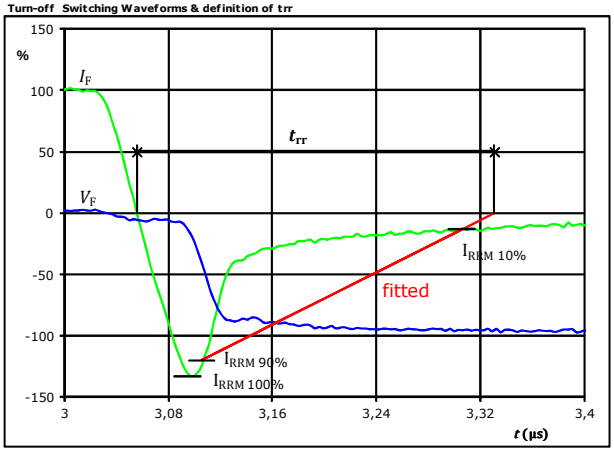
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	27,98	kW
$E_{on}(100\%)$ =	3,60	mJ
t_{Eon} =	0,38	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

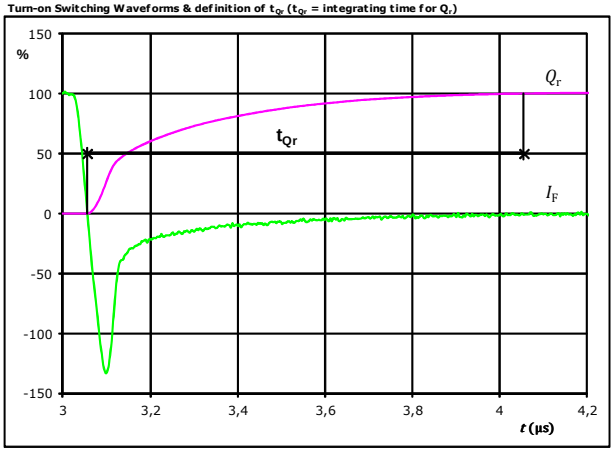


$V_F(100\%)$ =	350	V
$I_F(100\%)$ =	80	A
$I_{RRM}(100\%)$ =	-106	A
t_{rr} =	0,219	µs

Boost Switching Characteristics

figure 8. **FWD**

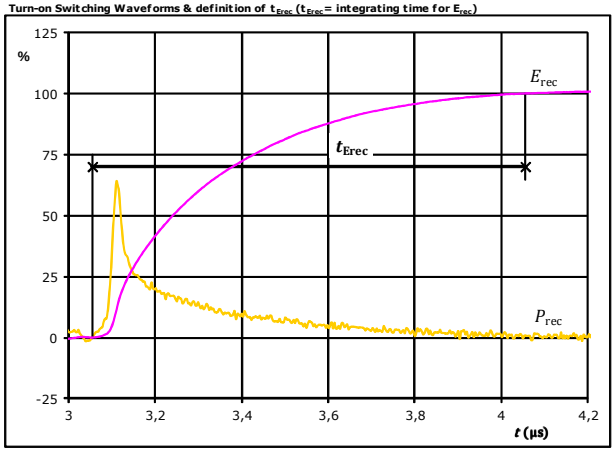
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	80	A
Q_r (100%) =	10,04	µC
t_{Qr} =	1,00	µs

figure 9. **FWD**

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



P_{rec} (100%) =	27,98	kW
E_{rec} (100%) =	2,19	mJ
t_{Erec} =	1,00	µs

Vincotech

Ordering Code & Marking

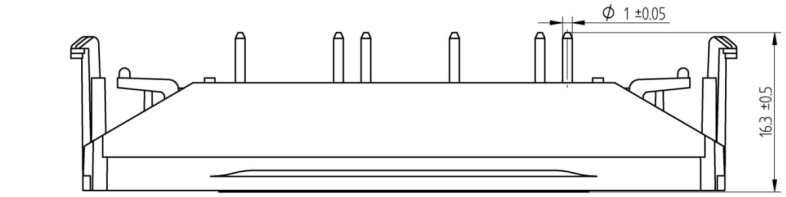
Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FZ07LBA100SM01-L705L18

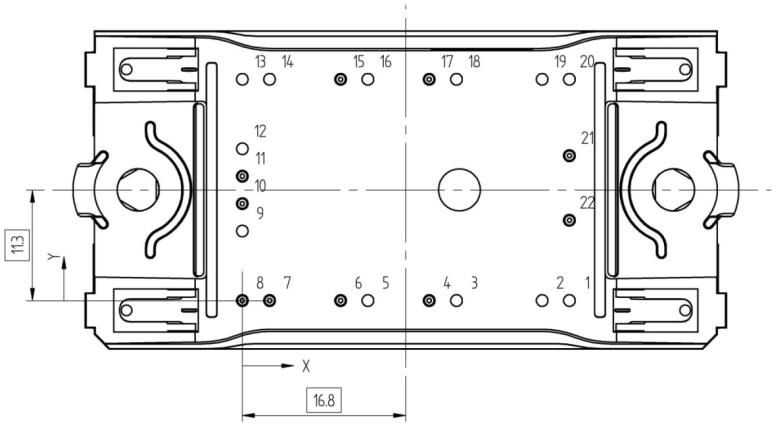
NN-NNNNNNNNNNNNNN
TTTTTTVV WWYY UL
VIN LLLLL SSSS

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

Outline

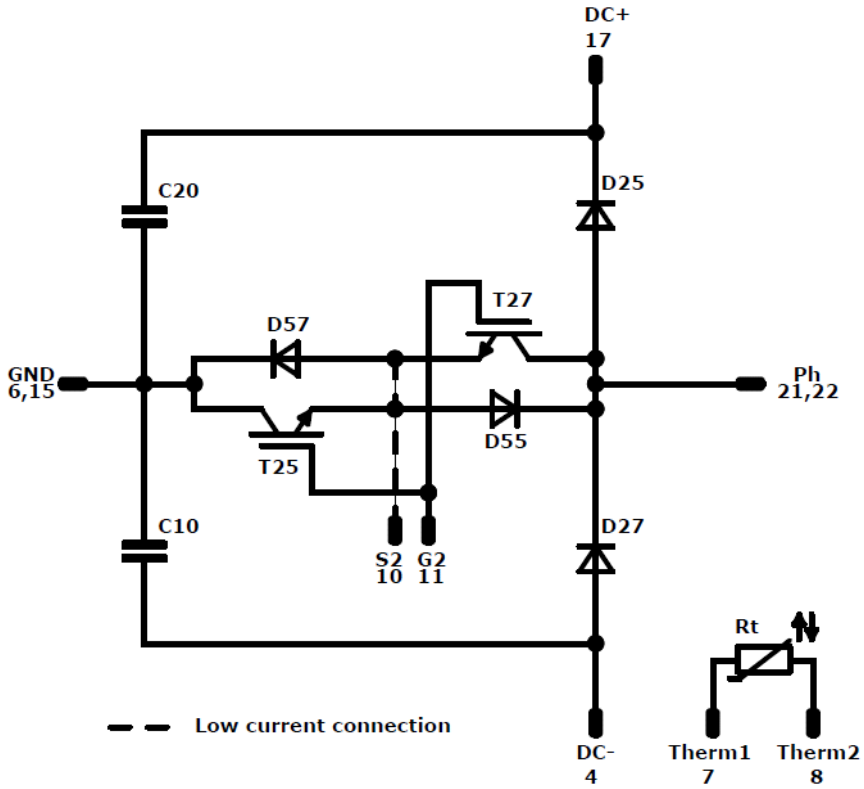
Pin table			
Pin	X	Y	Function
1	Not assembled		
2			
3			
4	19,2	0	-DC
5	Not assembled		
6	10,1	0	GND
7	2,8	0	Therm1
8	0	0	Therm2
9	Not assembled		
10	0	9,9	S2
11	0	12,7	G2
12	Not assembled		
13			
14			
15	10,1	22,6	GND
16	Not assembled		
17	19,2	22,6	+DC
18	Not assembled		
19			
20			
21	33,6	14,8	Ph
22	33,6	8,2	Ph





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

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T27 , T25	IGBT	650 V	100 A	Boost Switch	
D25 , D27	FWD	1200 V	100 A	Boost Diode	
D55 , D57	FWD	650 V	100 A	Buck Diode	
C10 , C20	Capacitor	500 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	

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

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 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-FZ07LBA100SM01-L705L18-D1-14	25 Jul. 2017		