Vincotech

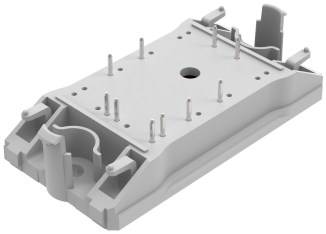
10-FZ07LBA100SM01-L705L18
datasheet

***flow*NPFC 0** **650 V / 100 A**

Features

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

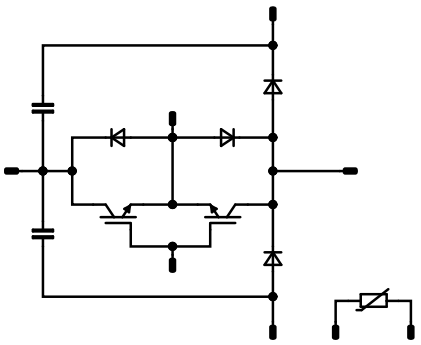
flow 0 12 mm housing



Target applications

- Power Supply
- UPS

Schematic



Types

- 10-FZ07LBA100SM01-L705L18

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Buck Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ T_s = 80 °C	84	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	122	W
Maximum junction temperature	T_{jmax}		175	°C
Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ T_s = 80 °C	78	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
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ T_s = 80 °C	63	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms T_j = 150 °C	550	A
Surge current capability	I^2t		1513	A^2s
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

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{jop}		-40…+(T_{jmax} - 25)	°C
Isolation Properties				
Isolation voltage	V_{isol}	DC Test Voltage* t_p = 2 s	6000	V
Isolation voltage	V_{isol}	AC Voltage t_p = 1 min	2500	V
Creepage distance			>12,7	mm
Clearance			9,15	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	
Buck Diode										
Static										
Forward voltage	V_F				100	25 150	1,18	1,78 1,57	1,82(1)	V
Reverse leakage current	I_R	V_r = 650 V				25			1,2	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,78		K/W

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	
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}			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(1)	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		pF
Reverse transfer capacitance	C_{res}							22		pF
Gate charge	Q_g		15	520	100	25		240		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,72		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	-5/15	350	80	25 125 150		73,8 71,8 70,2		ns
Rise time	t_r					25 125 150		19,8 22,4 22		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		162,4 176,4 179,8		ns
Fall time	t_f					25 125 150		6,11 9,5 8,91		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=4,92 µC Q_{rFWD}=10,04 µC Q_{rFWD}=12,44 µC				25 125 150		2,75 3,6 3,93		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,297 0,515 0,594		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	
Boost Diode										
Static										
Forward voltage	V_F				100	25 125 150		2,24 2,45 2,38	2,52[1] 2,47[1]	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		 8800	120 17700	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						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	-5/15	350	80	25 125 150		78,52 106,41 116,57		A
Reverse recovery time	t_{rr}					25 125 150		119,16 219,11 243,11		ns
Recovered charge	Q_r					25 125 150		4,92 10,04 12,44		µC
Reverse recovered energy	E_{rec}					25 125 150		0,89 2,19 2,78		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3514 3663 3540		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	
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		150		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-12		14	%
Power dissipation	P							200		mW
Power dissipation constant	d					25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3 %						3950		K
B-value	$B_{(25/100)}$	Tol. ±3 %						3998		K
Vincotech Thermistor Reference									B	

(1) Value at chip level

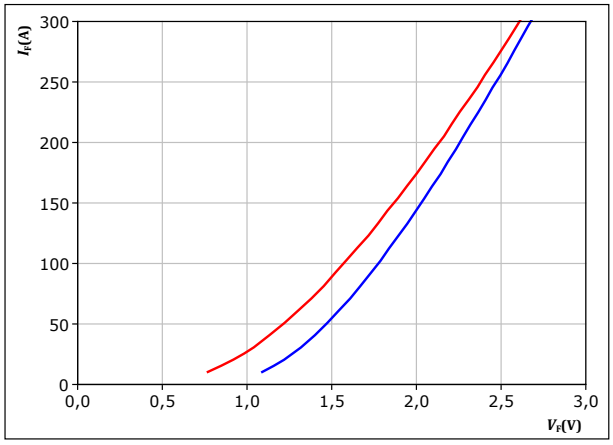
(2) Only valid with pre-applied Vincotech thermal interface material.

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



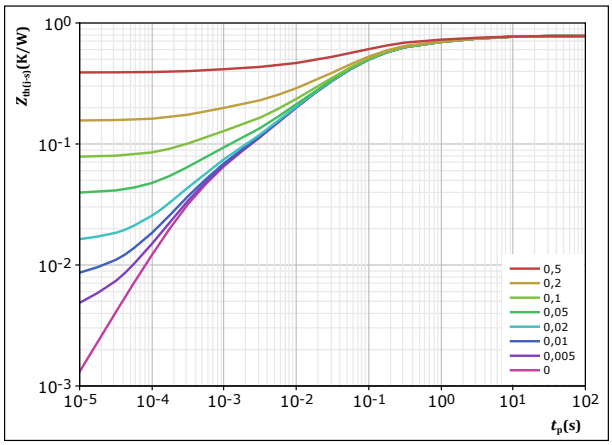
t_p = 250 µs

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

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

FWD thermal model values

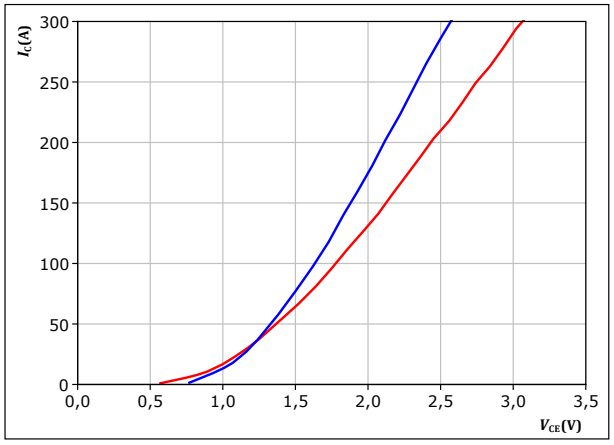
R (K/W)	τ (s)
5,76E-02	5,42E+00
8,79E-02	1,09E+00
2,14E-01	1,59E-01
2,31E-01	4,95E-02
1,16E-01	1,05E-02
3,20E-02	2,39E-03
4,19E-02	4,10E-04

Boost Switch Characteristics

figure 3. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

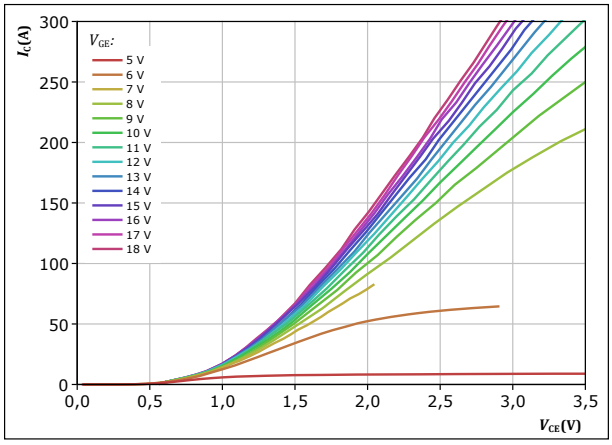


t_p =	250	µs	T_j:	25 °C
V_{GE} =	15	V		125 °C

figure 4. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



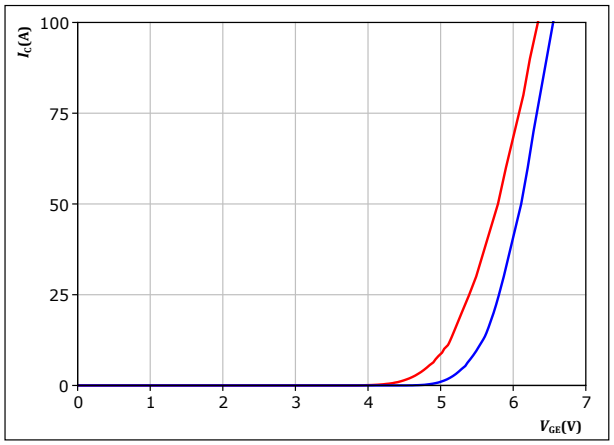
t_p =	250	µs
T_j =	125	°C

V_{GE} from 5 V to 18 V in steps of 1 V

figure 5. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

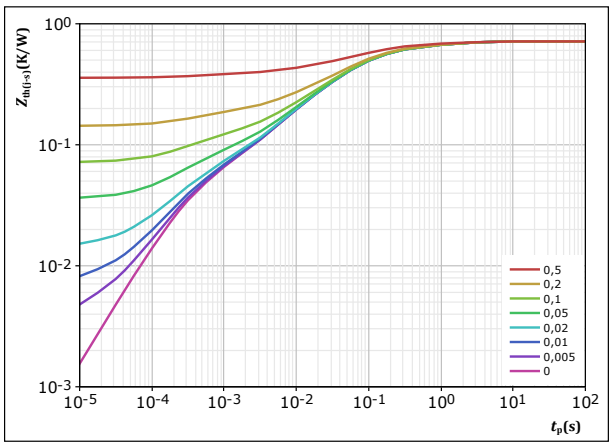


t_p =	250	µs	T_j:	25 °C
V_{CE} =	10	V		125 °C

figure 6. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,715	K/W

IGBT thermal model values

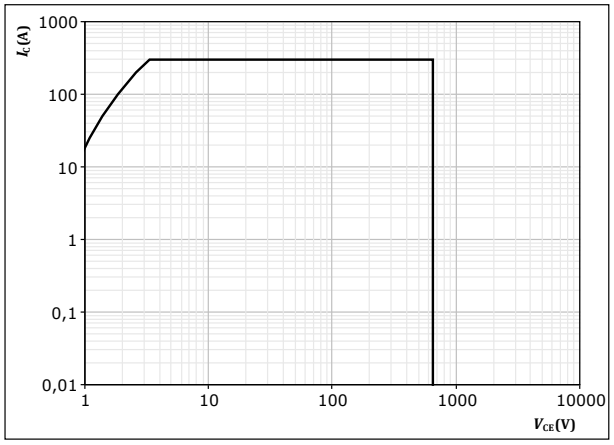
R (K/W)	τ (s)
7,52E-02	1,73E+00
1,31E-01	2,44E-01
3,01E-01	6,32E-02
1,21E-01	1,39E-02
4,30E-02	3,50E-03
4,35E-02	3,33E-04

Boost Switch Characteristics

figure 7. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



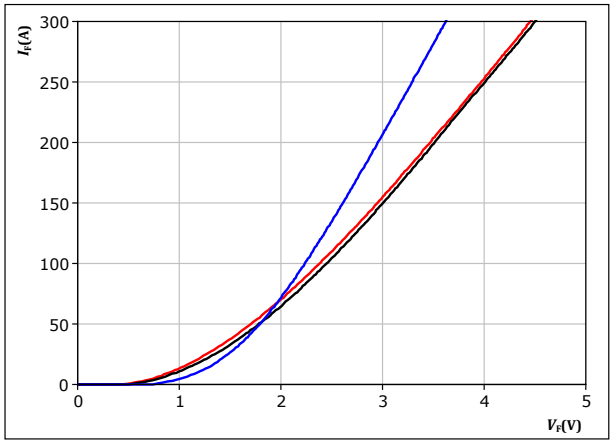
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 8. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



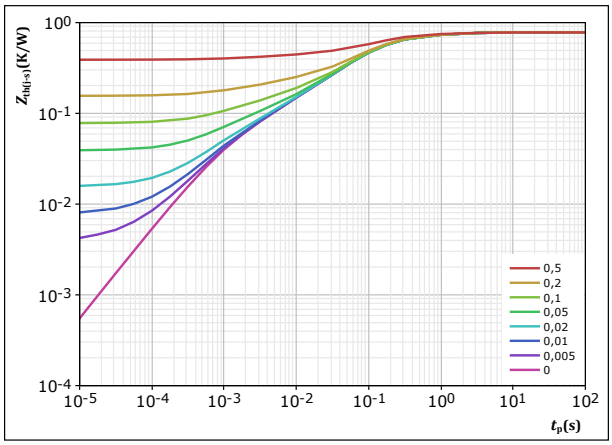
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 9. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,779 K/W

FWD thermal model values

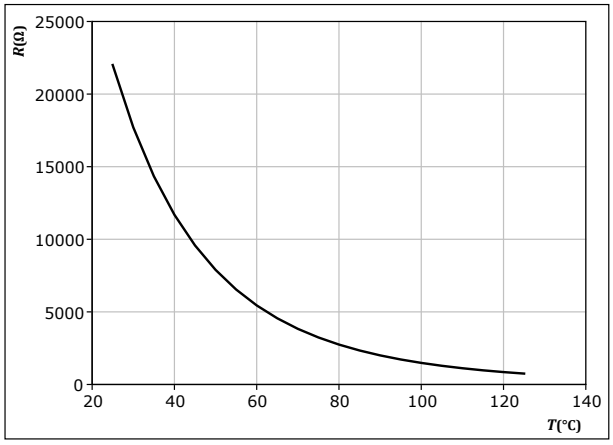
R (K/W)	τ (s)
7,81E-02	1,59E+00
1,93E-01	2,55E-01
3,99E-01	7,68E-02
7,07E-02	6,98E-03
3,88E-02	9,88E-04

Thermistor Characteristics

figure 10. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

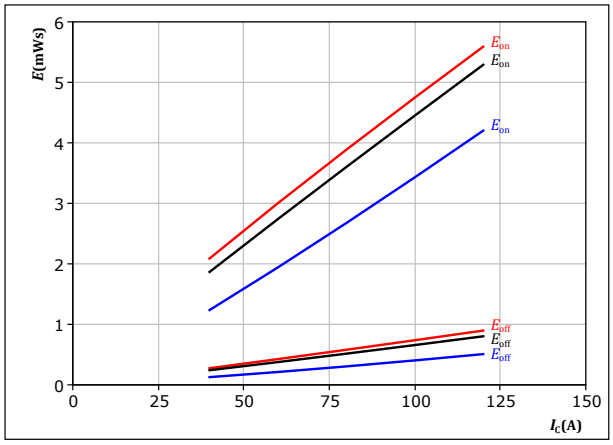


Boost Switching Characteristics

figure 11. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



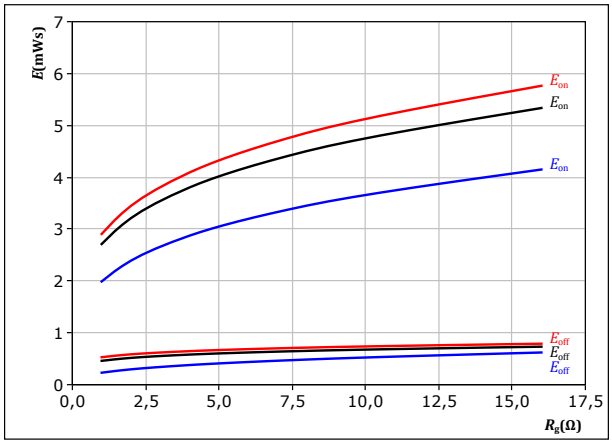
With an inductive load at

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

figure 12. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



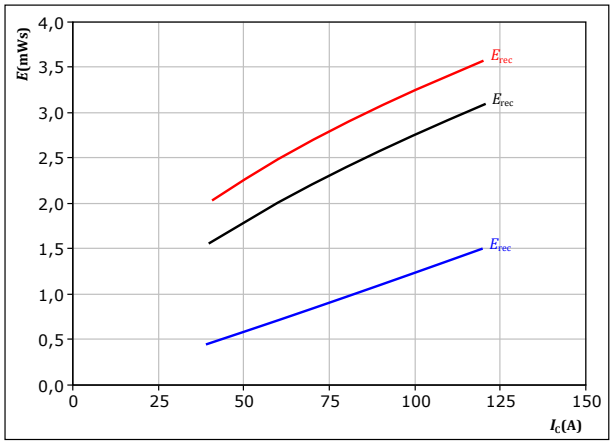
With an inductive load at

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

figure 13. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



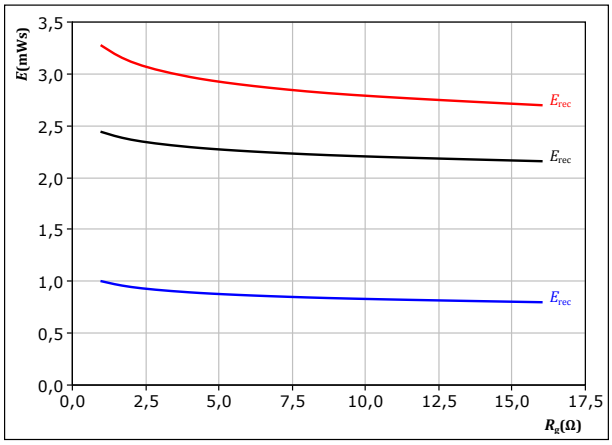
With an inductive load at

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

figure 14. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

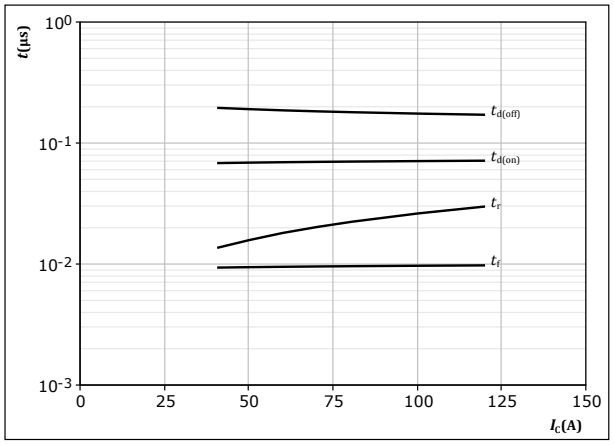
			T_j:	
V_{CE} =	350	V		25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	80	A		150 °C

Boost Switching Characteristics

figure 15. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



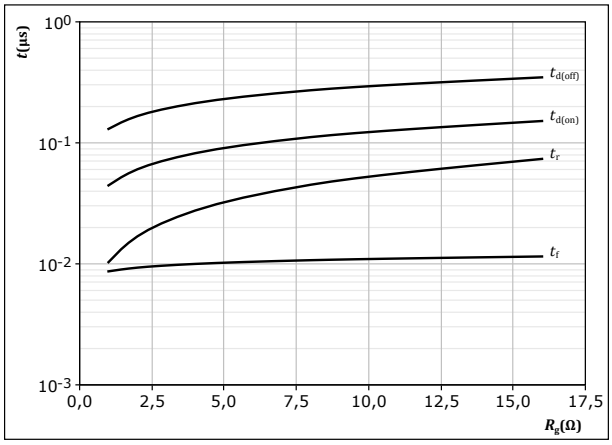
With an inductive load at

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

figure 16. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



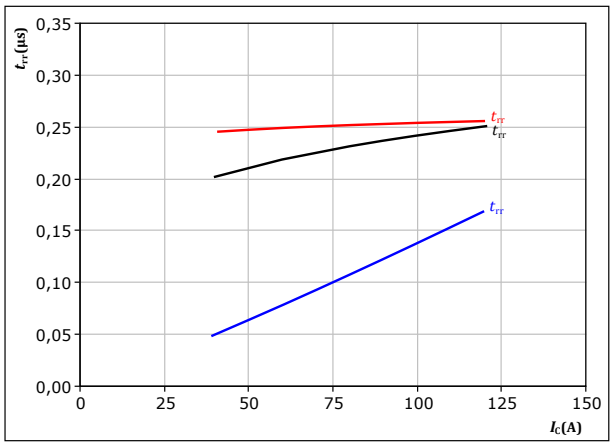
With an inductive load at

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

figure 17. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

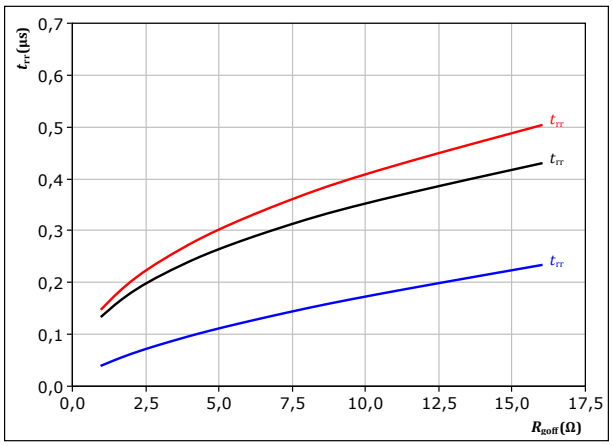
V_{CE} =	350	V
V_{GE} =	-5/15	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 18. **FWD**

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

t_{rr} = f(R_{goff})



With an inductive load at

V_{CE} =	350	V
V_{GE} =	-5/15	V
I_C =	80	A

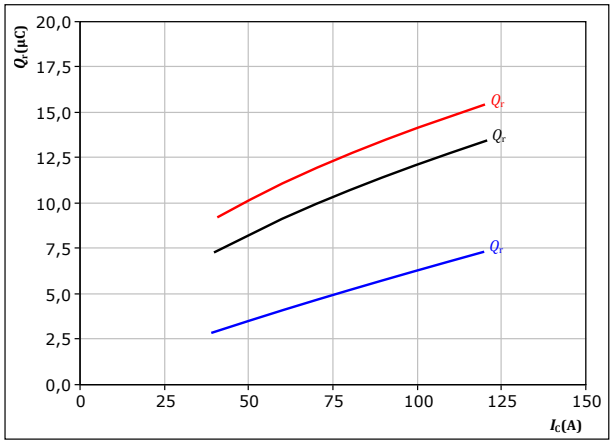
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 19. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



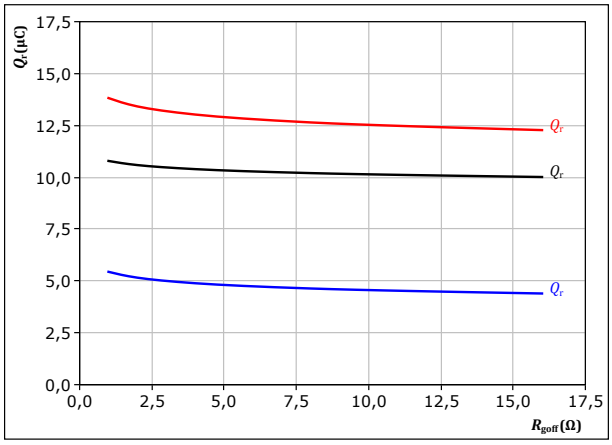
With an inductive load at

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

figure 20. **FWD**

Typical recovered charge as a function of turn off gate resistor

$Q_r = f(R_{goff})$



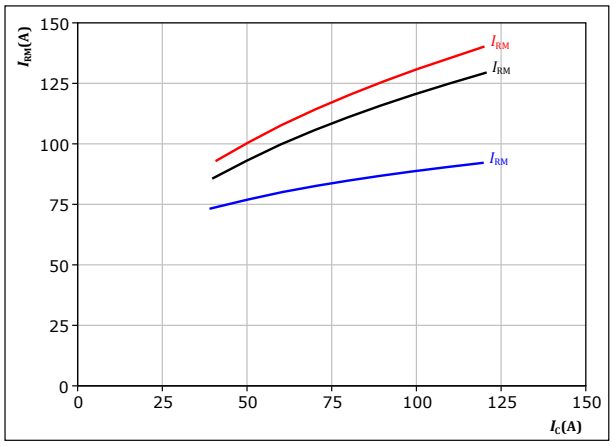
With an inductive load at

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

figure 21. **FWD**

Typical peak reverse recovery current as a function of collector current

$I_{RM} = f(I_C)$



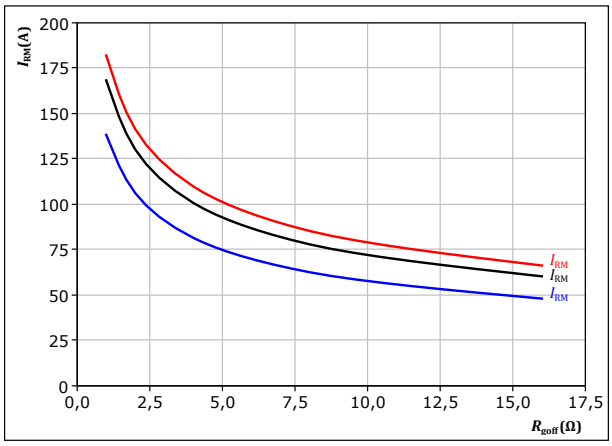
With an inductive load at

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

figure 22. **FWD**

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

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



With an inductive load at

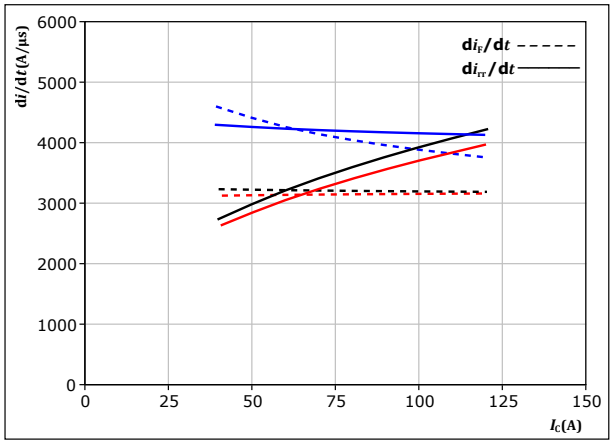
			T_j:	
V_{CE} =	350	V		25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	80	A		150 °C

Boost Switching Characteristics

figure 23. **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)



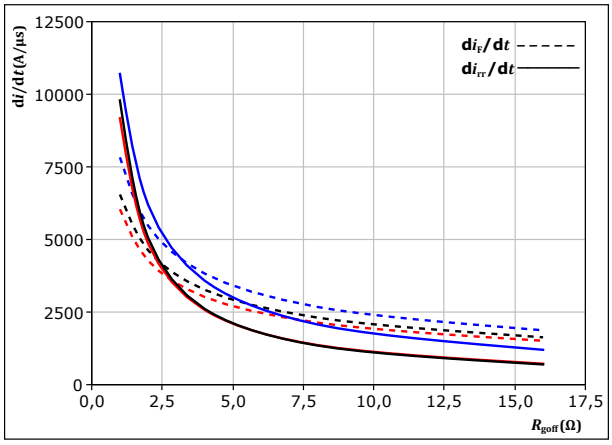
With an inductive load at

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

figure 24. **FWD**

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

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



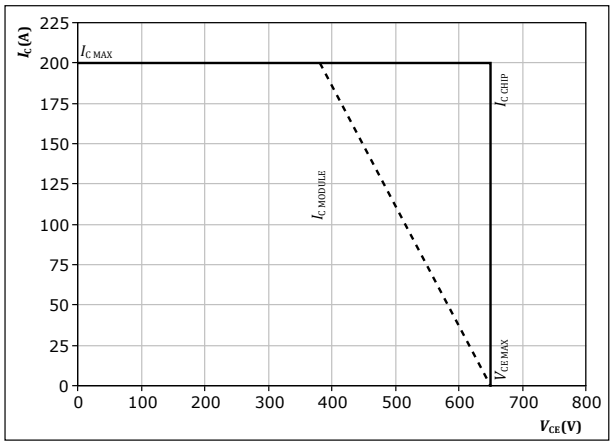
With an inductive load at

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

figure 25. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At

T_j =	150	°C	
R_{gon} =	4	Ω	
R_{goff} =	4	Ω	

Boost Switching Definitions

figure 26. **IGBT**

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

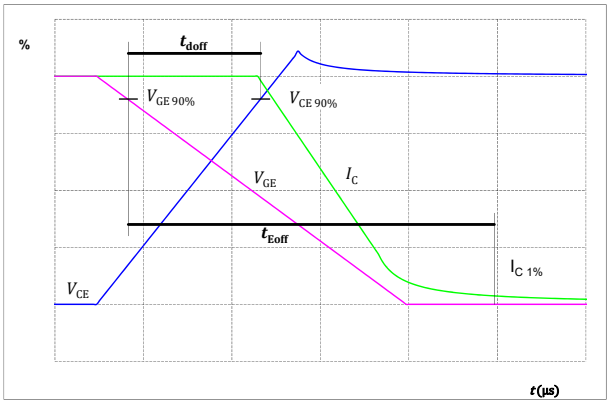


figure 27. **IGBT**

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

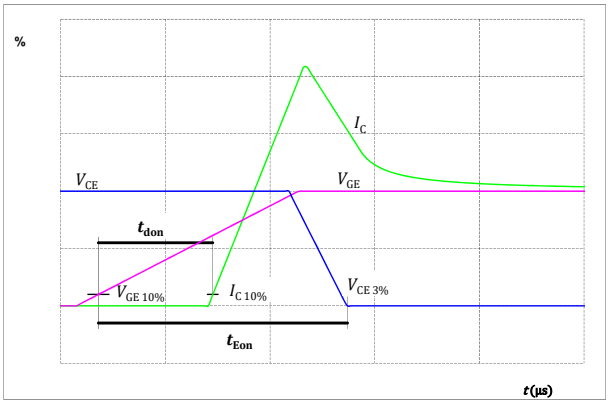


figure 28. **IGBT**

Turn-off Switching Waveforms & definition of t_f

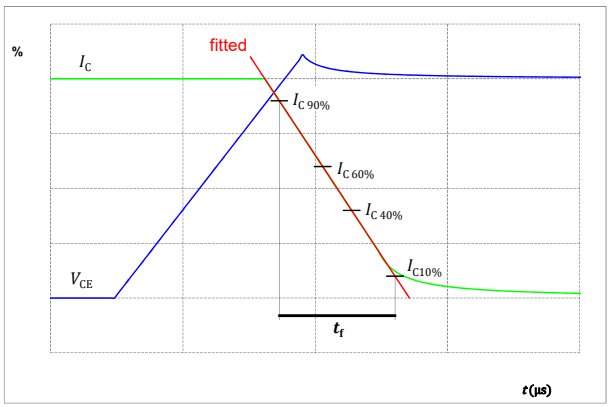
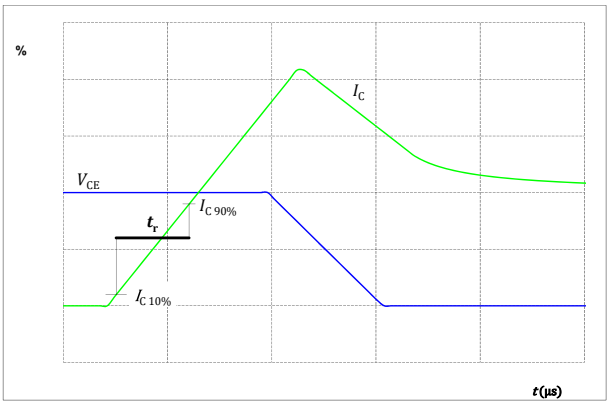


figure 29. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 30. **FWD**

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

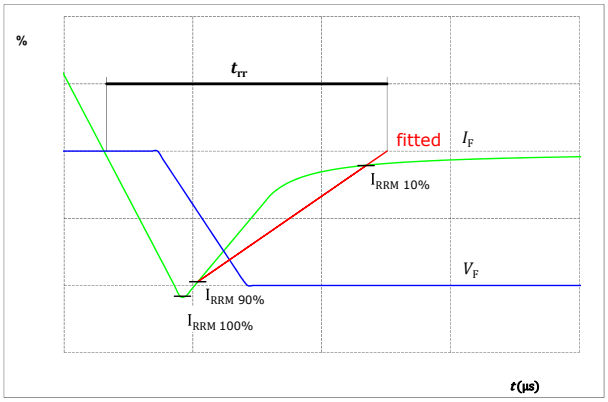
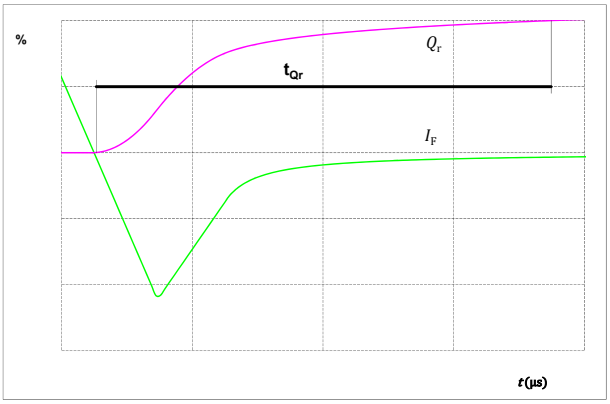


figure 31. **FWD**

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



Ordering Code

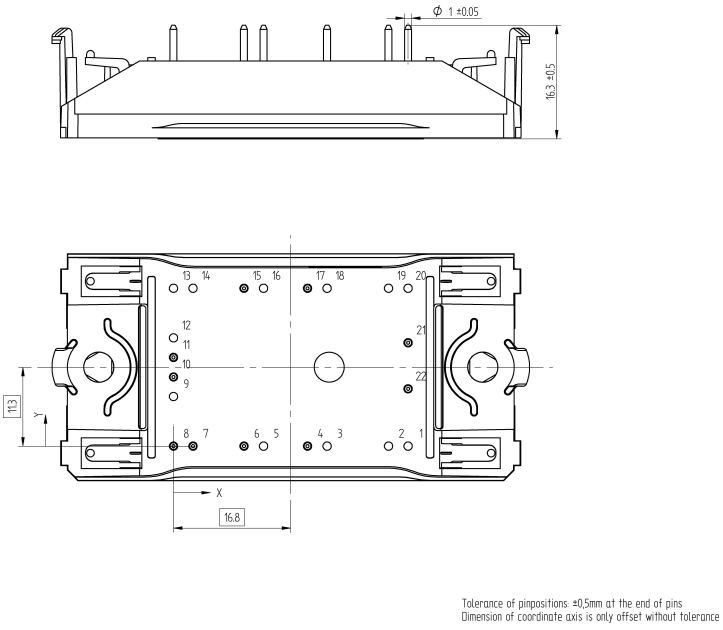
Version	Ordering Code
Without thermal paste	10-FZ07LBA100SM01-L705L18
With thermal paste (5,2 W/mK, PTM6000HV)	10-FZ07LBA100SM01-L705L18-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FZ07LBA100SM01-L705L18-/3/

Marking

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

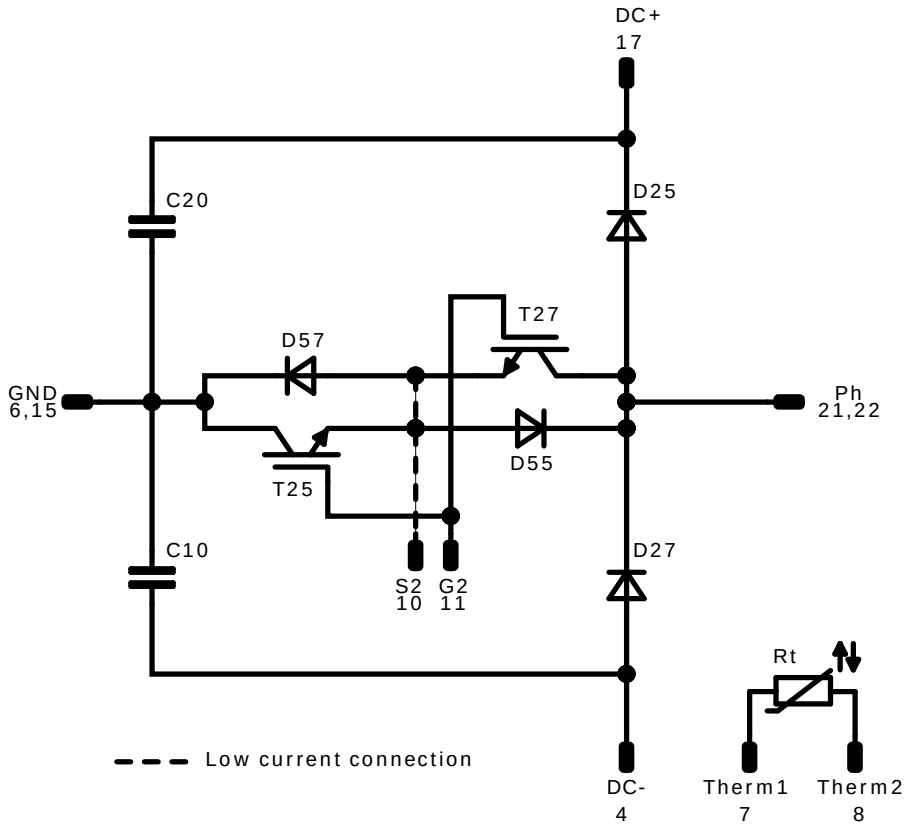
Outline

Pin table [mm]			
Pin	X	Y	Function
1	not assembled		
2	not assembled		
3	not assembled		
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	not assembled		
14	not assembled		
15	10,1	22,6	GND
16	not assembled		
17	19,2	22,6	+DC
18	not assembled		
19	not assembled		
20	not assembled		
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
D55 , D57	FWD	650 V	100 A	Buck Diode	
T27, T25	IGBT	650 V	100 A	Boost Switch	
D25, D27	FWD	1200 V	100 A	Boost 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.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-FZ07LBA100SM01-L705L18-D2-14	28 Sep. 2021	New Datasheet format, module is unchanged Update Boost Diode static measurements	