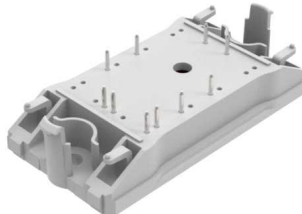
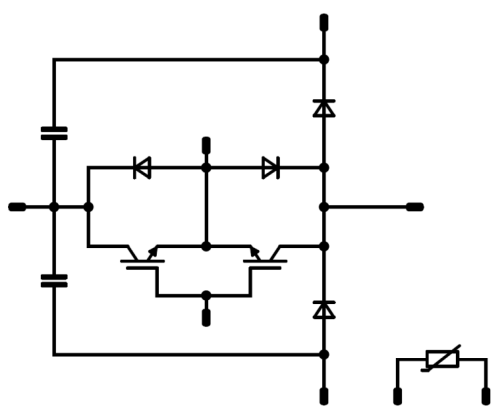




Vincotech

<i>flow NPFC 0</i>	650 V / 100 A
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> Three-phase NPFC topology High efficient IGBT H5 technology Low inductive design Integrated Thermistor 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;"><i>flow 0 12 mm housing</i></div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> Power Supply UPS 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Schematic</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> 10-FZ07LBA100SM01-L705L18 	

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	79	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	133	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum Junction Temperature	T_{jmax}		175	°C



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	66	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	85	A
Repetitive peak forward current	I_{FRM}		200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	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* $t_p = 2\text{ s}$	6000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance			9,15	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



Vincotech

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}							6000		pF
Output capacitance	C_{oes}	$f = 1$ MHz	0	25		25		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 $\lambda = 3,4$ W/mK						0,72		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		74 72 70		ns
Rise time	t_r	$R_{goff} = 4$ Ω $R_{gon} = 4$ Ω				25 125 150		20 22 22		
Turn-off delay time	$t_{d(off)}$		15/-5	350	80	25 125 150		162 176 180		
Fall time	t_f					25 125 150		6 10 9		
Turn-on energy (per pulse)	E_{on}	$Q_{t-FWD} = 4,9$ μC $Q_{t-FWD} = 10$ μC $Q_{t-FWD} = 12,4$ μC				25 125 150		2,749 3,595 3,926		
Turn-off energy (per pulse)	E_{off}					25 125 150		0,297 0,515 0,594		



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Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		

Boost Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
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	μ A

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK	0,78	K/W

Dynamic

Parameter	Symbol	dI/dt [A/ μ s]	V_{GS} [V]	V_{DS} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Peak recovery current	I_{RRM}				100		25 125 150		79 106 117		A
Reverse recovery time	t_{rr}				100		25 125 150		119 219 243		ns
Recovered charge	Q_r	$dI/dt = 4646$ A/ μ s $dI/dt = 3416$ A/ μ s $dI/dt = 3473$ A/ μ s	15/-5	350	80		25 125 150		4,918 10,042 12,437		μ C
Reverse recovered energy	E_{rec}				100		25 125 150		0,890 2,190 2,784		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$				100		25 125 150		3514 3663 3540		A/ μ s

Buck Diode

Static

Parameter	Symbol	V_{GS} [V]	V_{DS} [V]	I_D [A]	I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Forward voltage	V_F			100		25 150		1,77 1,57	1,82	V
Reverse leakage current	I_r		650			25			1,2	μ A

Thermal

Parameter	Symbol	Conditions	Value	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material $\lambda = 3,4$ W/mK	0,78	K/W

Capacitor (DC)

Parameter	Symbol	Conditions	Value	Unit	
Capacitance	C		150	nF	
Tolerance			-10	+10	%
Dissipation factor		$f = 1$ kHz	25	2,5	%
Climatic category			55/125/56		



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	I_C [A]	T_j [°C]	Min	Typ	

Thermistor

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1486 \Omega$				100	-12		+14	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 3\%$				25		3950		K
B-value	$B_{(25/100)}$	Tol. $\pm 3\%$				25		3998		K
Vincotech NTC Reference									B	

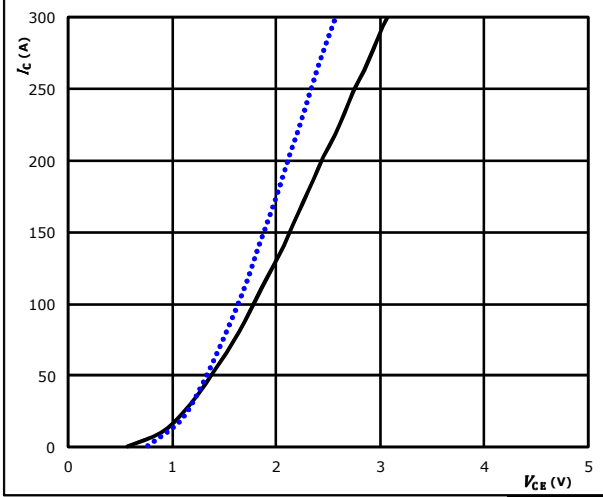


Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

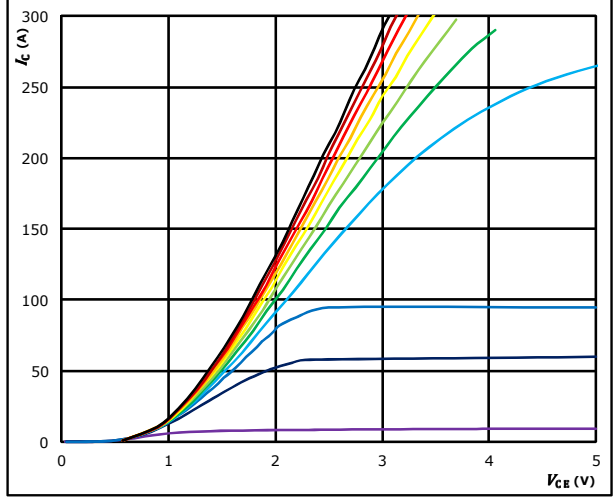


$t_p = 250 \mu s$ $T_j = 25 \text{ }^\circ C$ (dotted blue line)
 $V_{GE} = 15 V$ $T_j = 125 \text{ }^\circ C$ (solid black line)

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

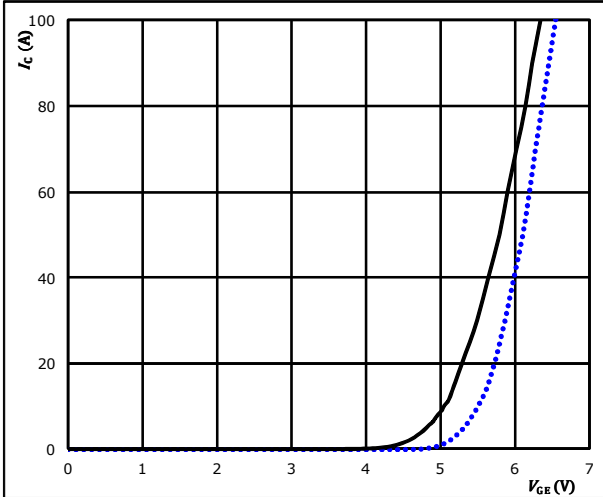


$t_p = 250 \mu s$ $T_j = 125 \text{ }^\circ C$
 V_{GE} from 5 V to 19 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

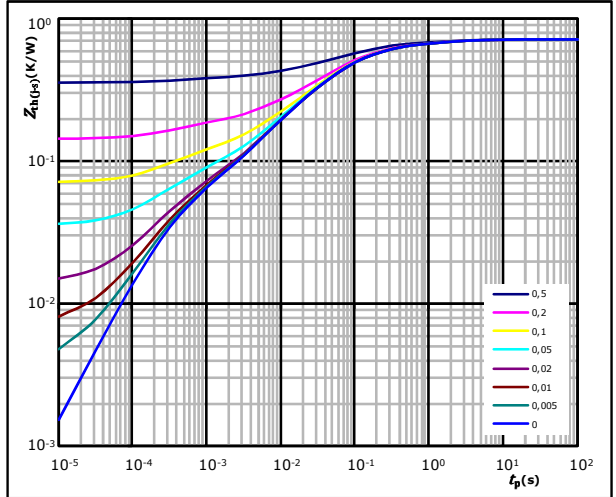


$t_p = 100 \mu s$ $T_j = 25 \text{ }^\circ C$ (dotted blue line)
 $V_{CE} = 10 V$ $T_j = 125 \text{ }^\circ C$ (solid black line)

figure 4. IGBT

Transient Thermal Impedance as function of Pulse duration

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



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

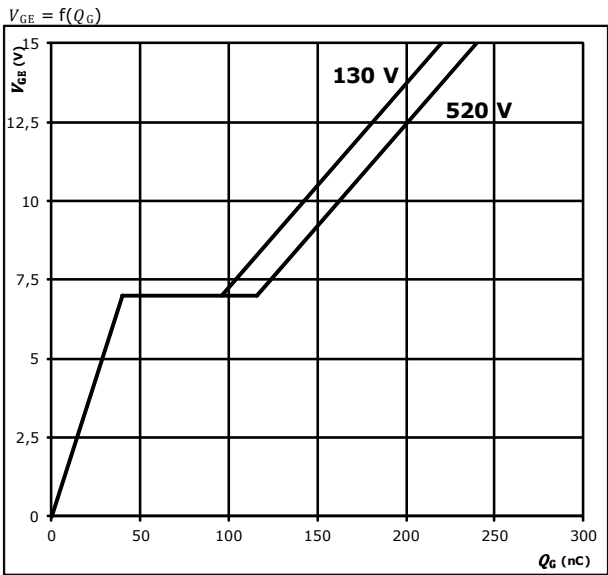
IGBT thermal model values

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



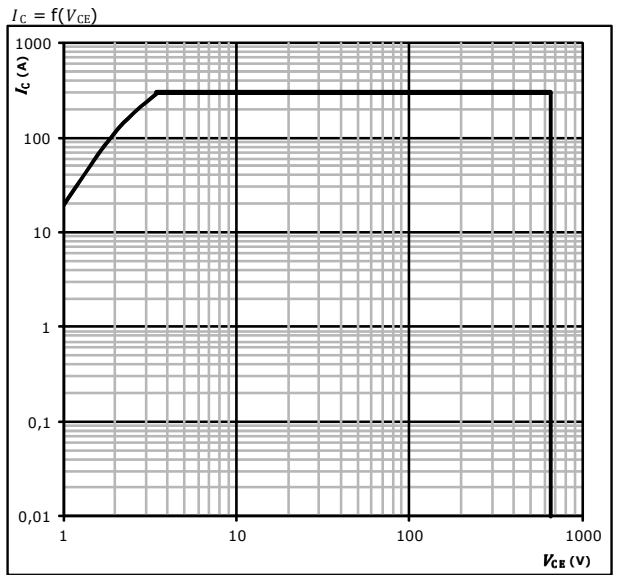
Boost Switch Characteristics

figure 5. IGBT
Gate voltage vs Gate charge



At
 $I_C = 100$ A

figure 6. IGBT
Safe operating area



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

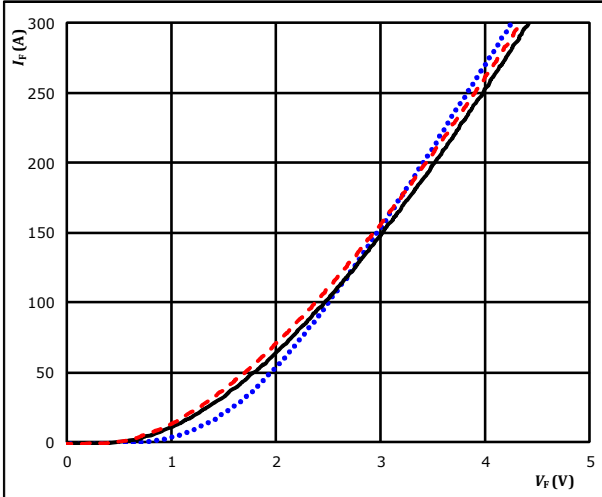


Boost Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



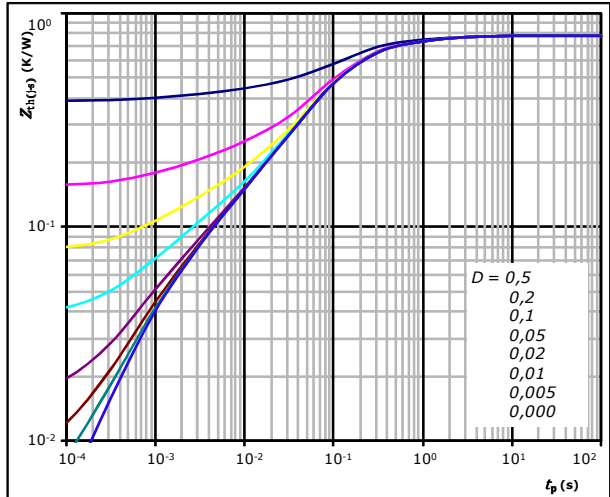
$t_p = 250 \mu s$

T_j : 25 °C (blue dotted line)
125 °C (black solid line)
150 °C (red dashed line)

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

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

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



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Buck Diode Characteristics

figure 1. FWD
Typical forward characteristics

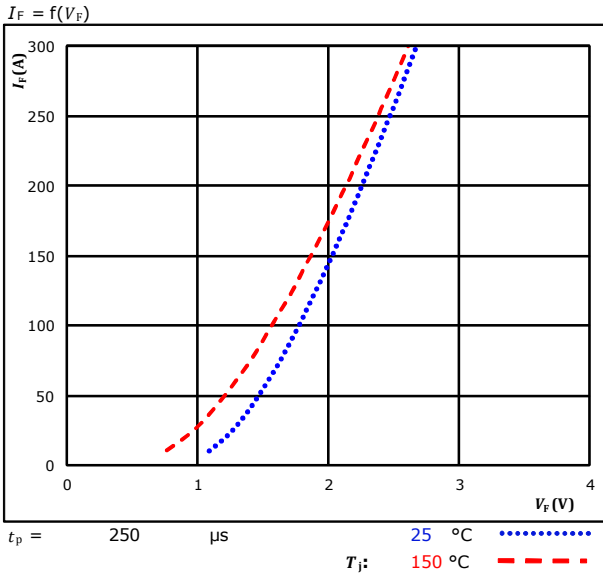
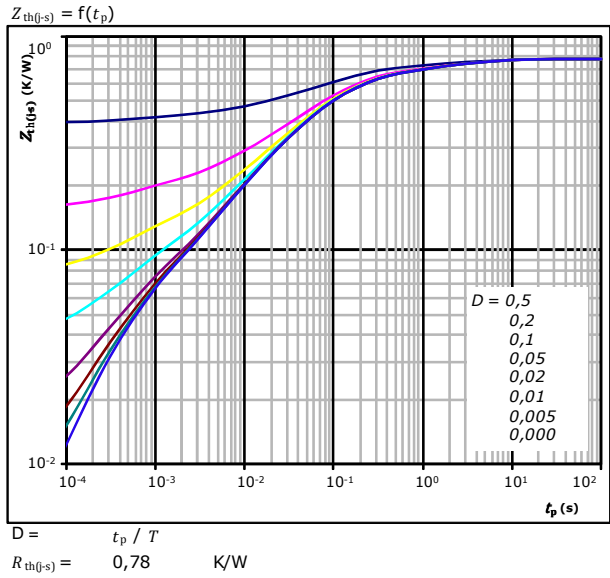


figure 2. FWD
Transient thermal impedance as a function of pulse width



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

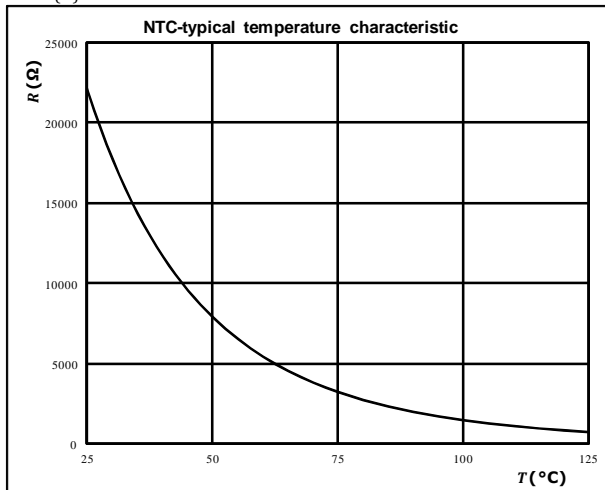


Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
as a function of temperature

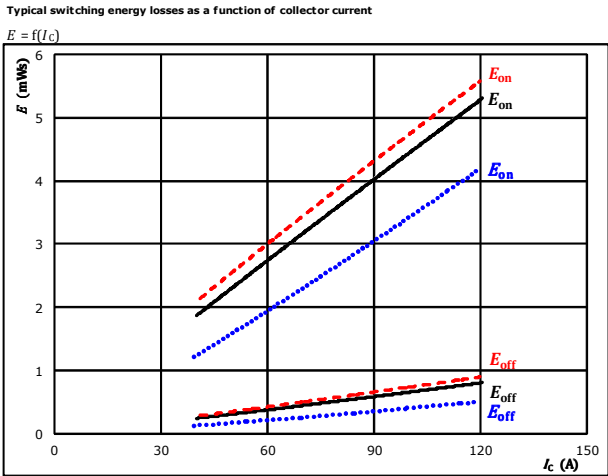
$$R = f(T)$$





Boost Switching Characteristics

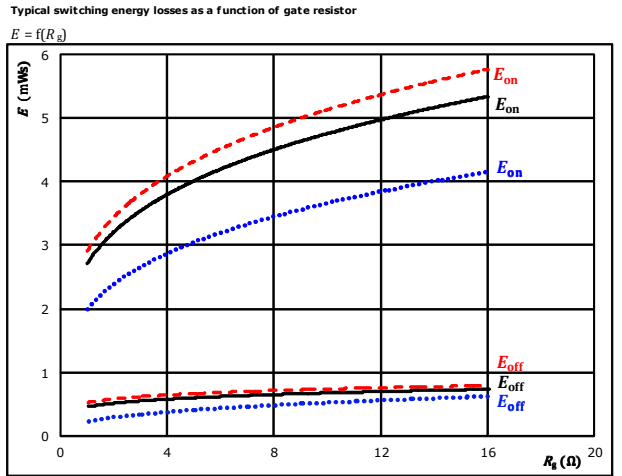
figure 1. IGBT



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		

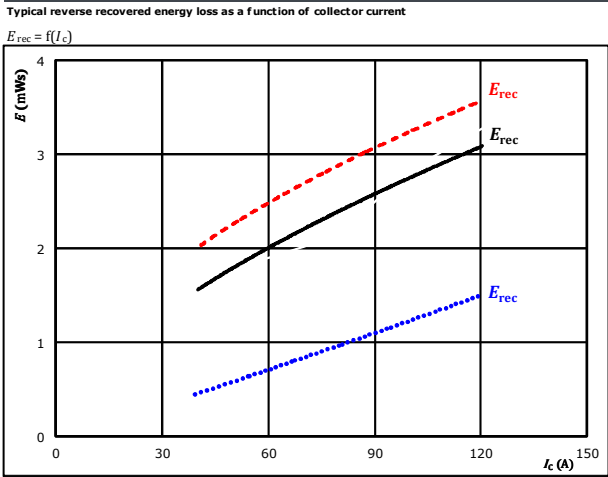
figure 2. IGBT



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	-----

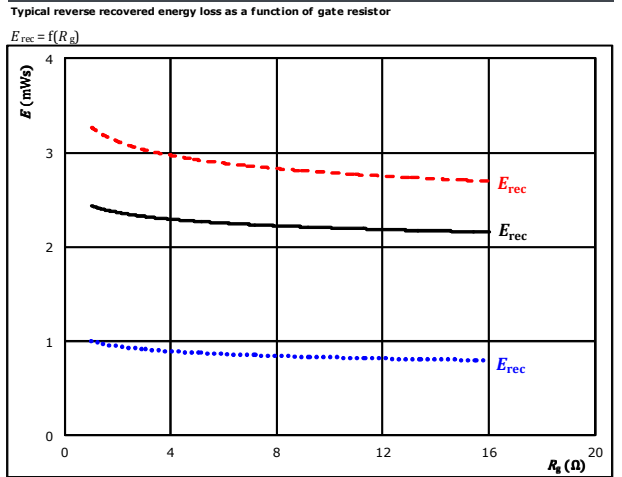
figure 3. FWD



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



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	-----

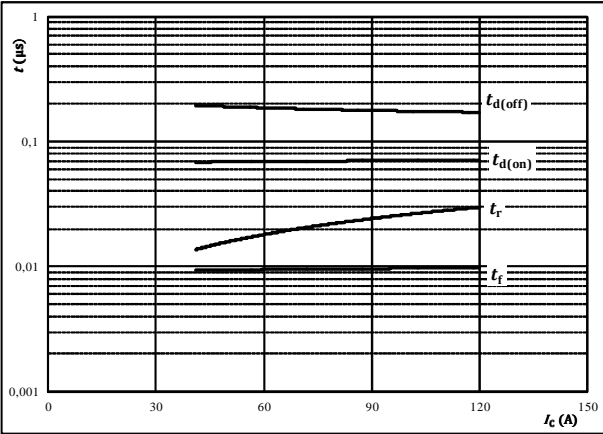


Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



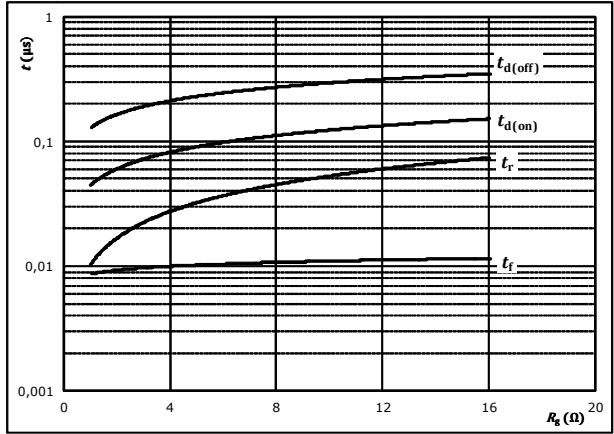
With an inductive load at

- $T_j = 150$ °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

$t = f(R_g)$



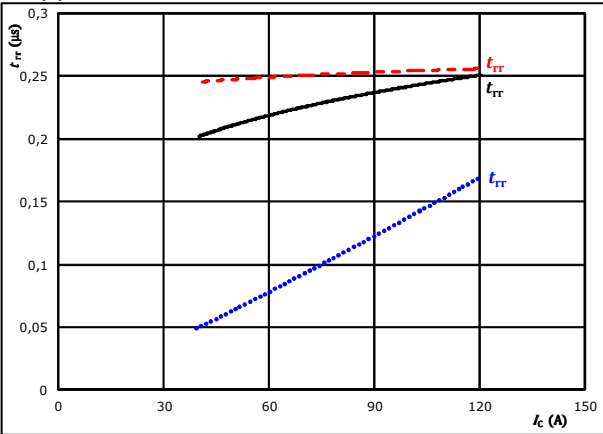
With an inductive load at

- $T_j = 150$ °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

$t_{rr} = f(I_C)$

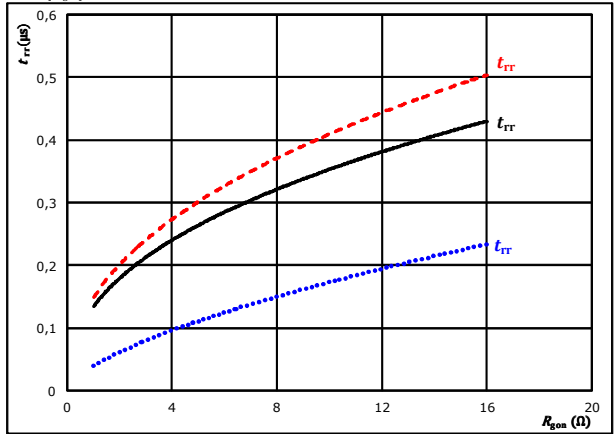


- At
- $V_{CE} = 350$ V
 - $V_{GE} = 15/-5$ V
 - $R_{gon} = 4$ Ω
 - $T_j: 25$ °C (dotted blue)
 - $T_j: 125$ °C (solid black)
 - $T_j: 150$ °C (dashed red)

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
 - $V_{GE} = 15/-5$ V
 - $I_C = 80$ A
 - $T_j: 25$ °C (dotted blue)
 - $T_j: 125$ °C (solid black)
 - $T_j: 150$ °C (dashed red)

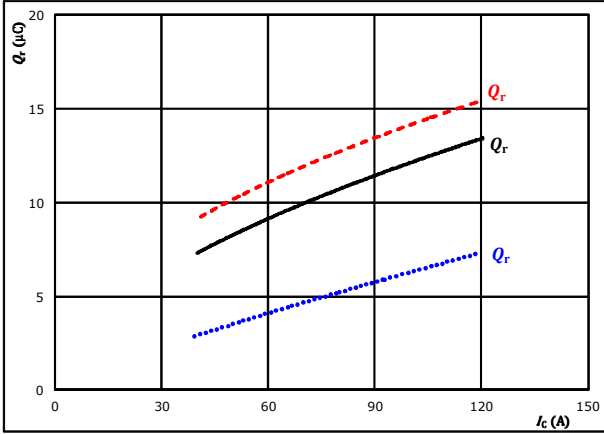


Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

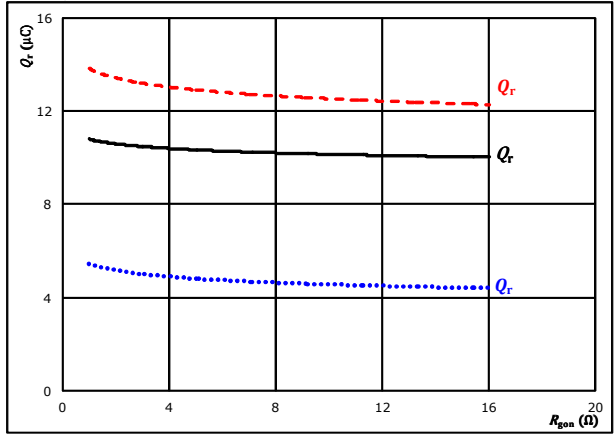


At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = 15/-5$ V $T_j = 125$ °C ———
 $R_{gpn} = 4$ Ω $T_j = 150$ °C - - - - -

figure 10. FWD

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

$$Q_r = f(R_{gpn})$$

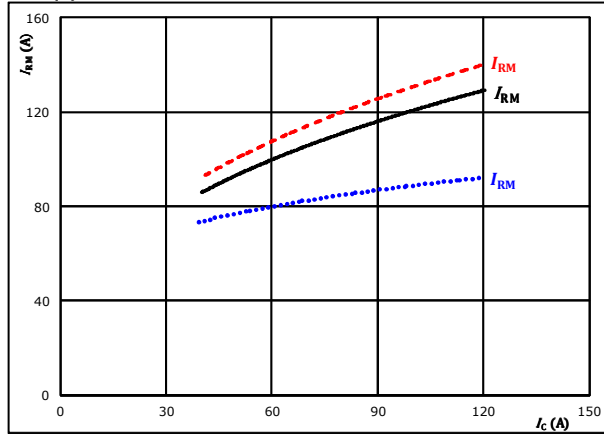


At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = 15/-5$ V $T_j = 125$ °C ———
 $I_c = 80$ A $T_j = 150$ °C - - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$

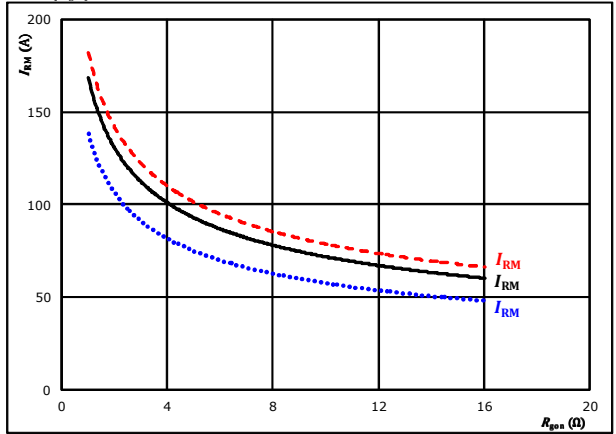


At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = 15/-5$ V $T_j = 125$ °C ———
 $R_{gpn} = 4$ Ω $T_j = 150$ °C - - - - -

figure 12. FWD

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

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



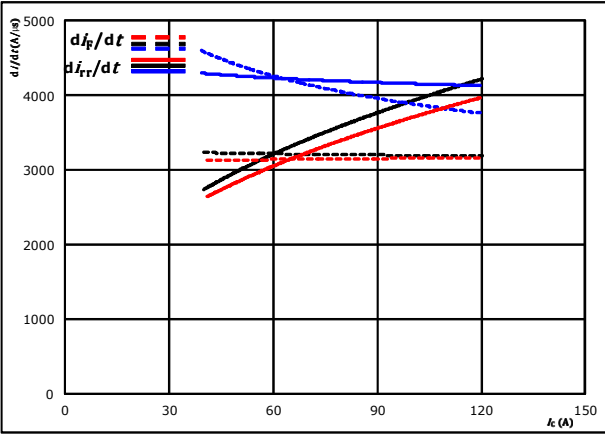
At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = 15/-5$ V $T_j = 125$ °C ———
 $I_c = 80$ A $T_j = 150$ °C - - - - -



Boost Switching Characteristics

figure 13. FWD

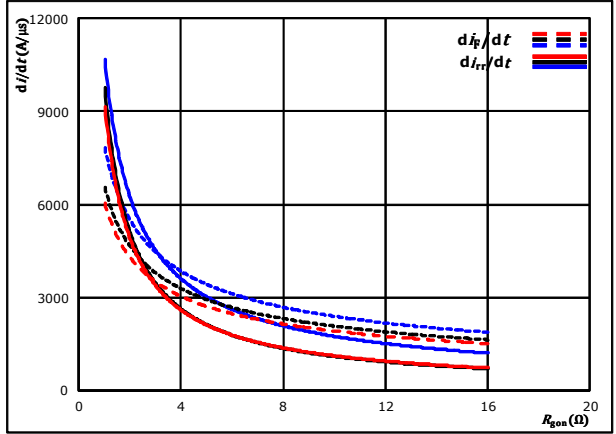
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = 15/-5$ V $T_j = 125$ °C ———
 $R_{gpn} = 4$ Ω $T_j = 150$ °C - - - - -

figure 14. FWD

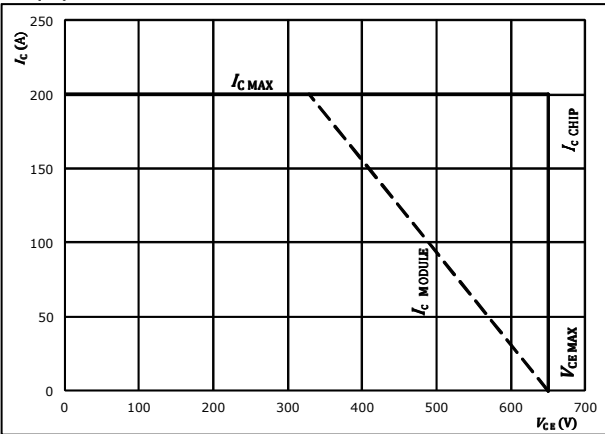
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gpn})$



At $V_{CE} = 350$ V $T_j = 25$ °C
 $V_{GE} = 15/-5$ V $T_j = 125$ °C ———
 $I_c = 80$ A $T_j = 150$ °C - - - - -

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



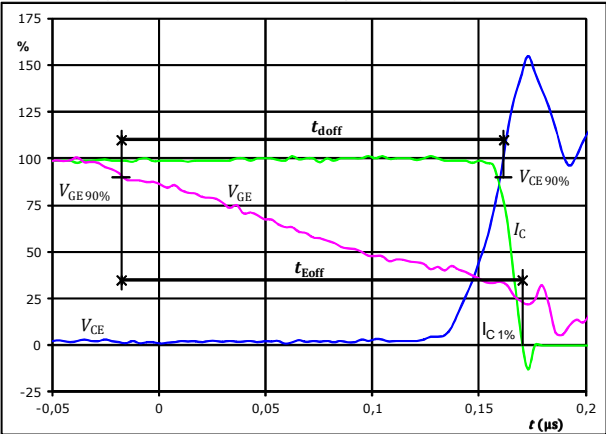
At $T_j = 175$ °C
 $R_{gpn} = 4$ Ω
 $R_{goff} = 4$ Ω



Boost Switching Definitions

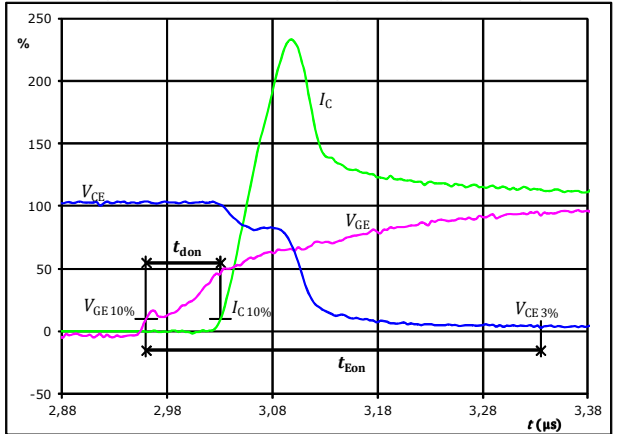
General conditions		
T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

figure 1. IGBT
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



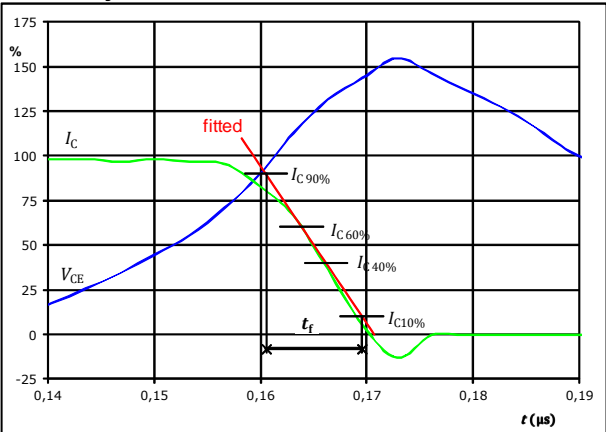
$V_{GE}(0\%) =$	-5	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	80	A
$t_{doff} =$	0,176	µs
$t_{Eoff} =$	0,188	µs

figure 2. IGBT
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



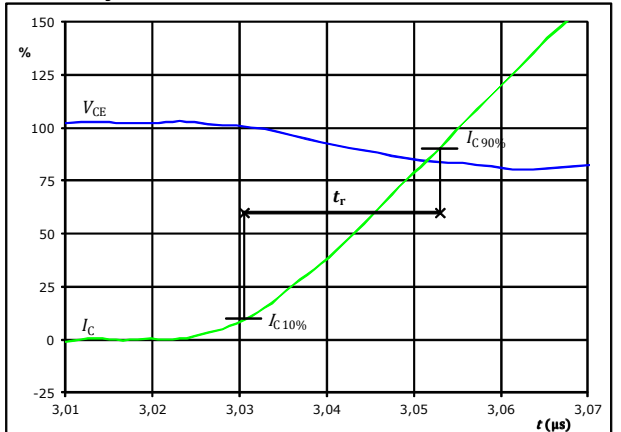
$V_{GE}(0\%) =$	-5	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	80	A
$t_{don} =$	0,072	µs
$t_{Eon} =$	0,375	µs

figure 3. IGBT
Turn-off Switching Waveforms & definition of t_f



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

figure 4. IGBT
Turn-on Switching Waveforms & definition of t_r



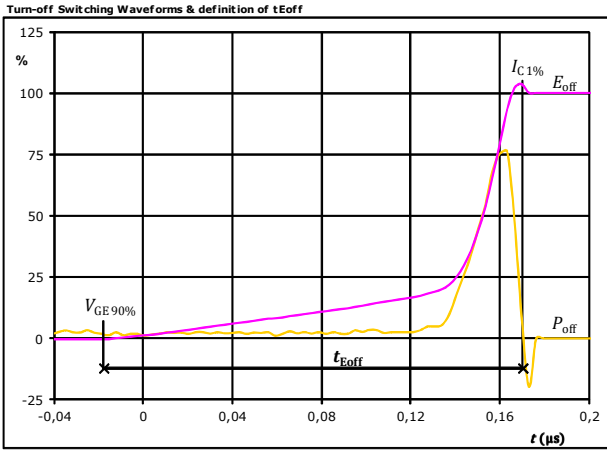
$V_C(100\%) =$	350	V
$I_C(100\%) =$	80	A
$t_r =$	0,022	µs



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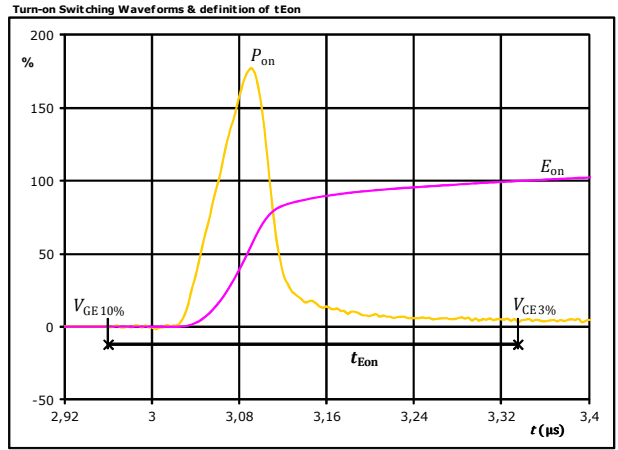
Boost Switching Characteristics

figure 5. IGBT



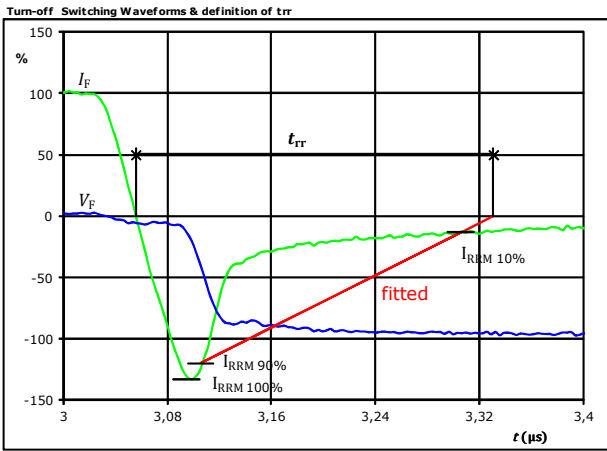
$P_{off}(100\%) = 27,98$ kW
 $E_{off}(100\%) = 0,52$ mJ
 $t_{Eoff} = 0,19$ μ s

figure 6. IGBT



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

figure 7. FWD



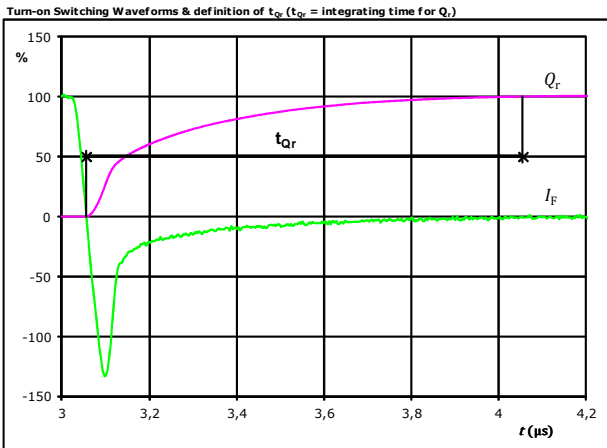
$V_F(100\%) = 350$ V
 $I_F(100\%) = 80$ A
 $I_{RRM}(100\%) = -106$ A
 $t_{tr} = 0,219$ μ s



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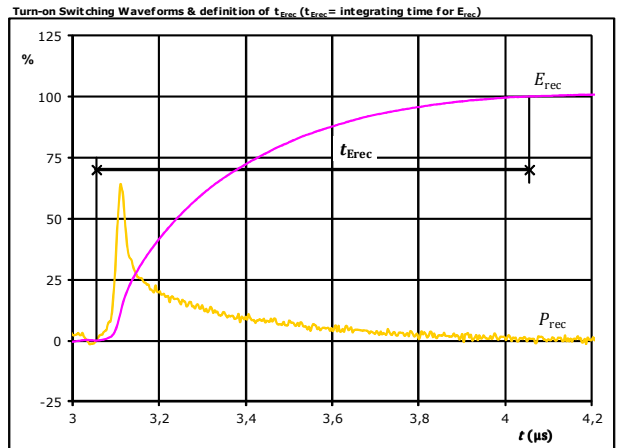
Boost Switching Characteristics

figure 8. FWD



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



figure 9. FWD



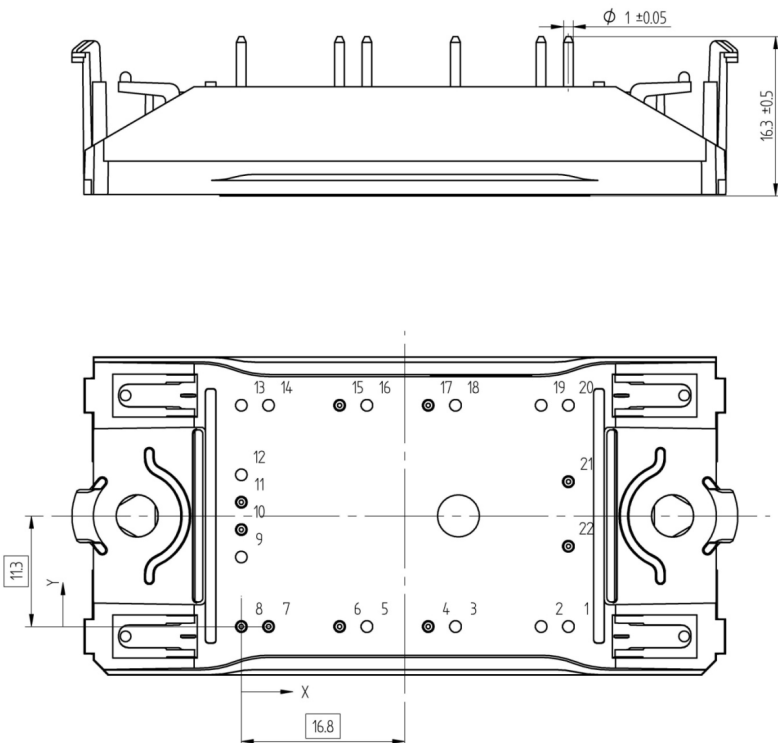
P_{rec} (100%) =	27,98	kW
E_{rec} (100%) =	2,19	mJ
t_{Erec} =	1,00	μs



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Ordering Code & Marking						
Version			Ordering Code			
without thermal paste 12 mm housing with solder pins			10-FZ07LBA100SM01-L705L18			
NN-NNNNNNNNNNNN TTTTUVVWWYY UL VIN LLLL SSSS						
Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNN-TTTTUVV		WWYY	UL VIN	LLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTUVV	LLLL	SSSS	WWYY		

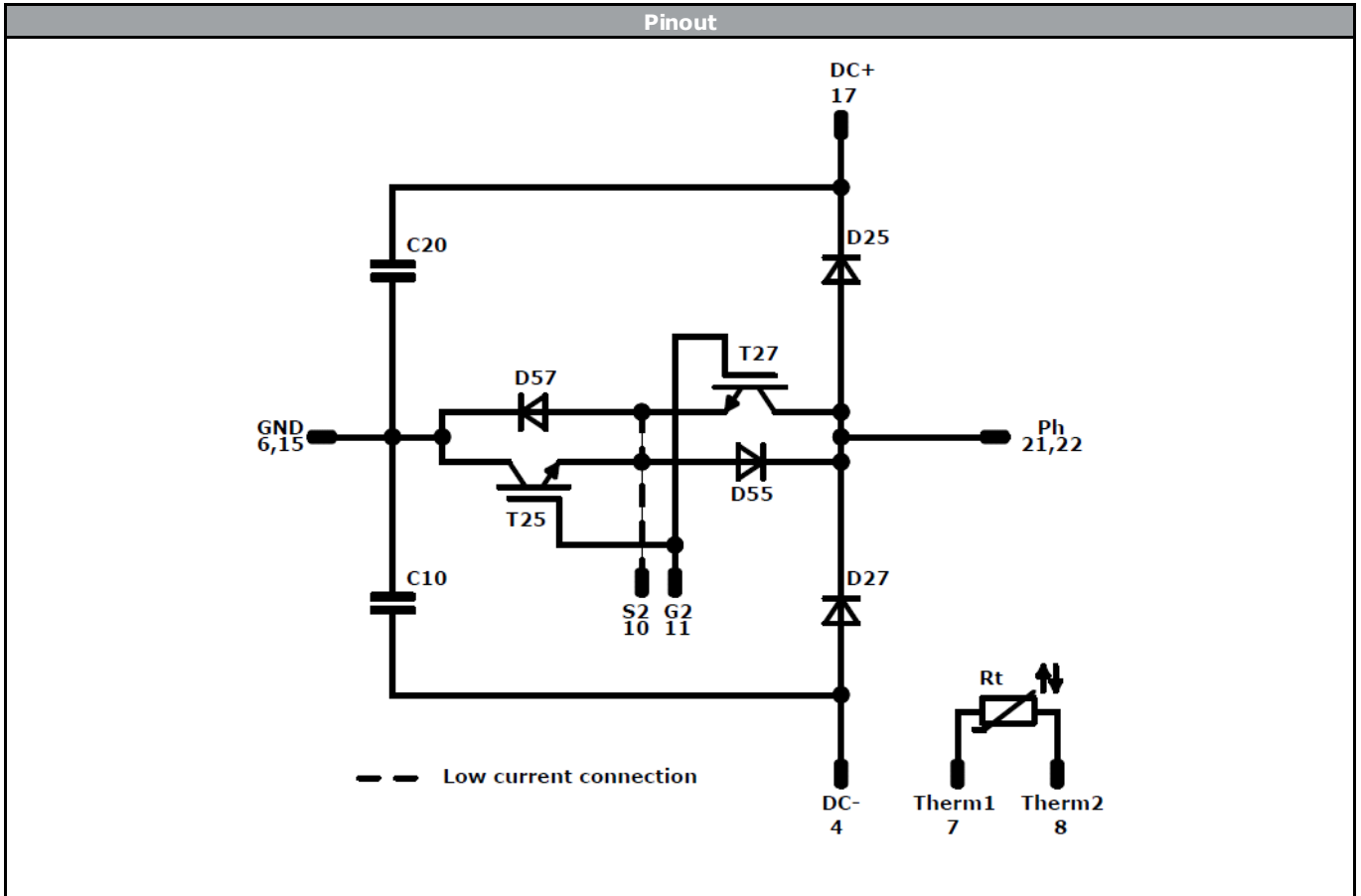
Pin table			
Pin	X	Y	Function
1			Not assembled
2			
3			
4	19,2	0	-DC
5			Not assembled
6	10,1	0	GND
7	2,8	0	Therm1
8	0	0	Therm2
9			Not assembled
10	0	9,9	S2
11	0	12,7	G2
12			Not assembled
13			
14			
15	10,1	22,6	GND
16			Not assembled
17	19,2	22,6	+DC
18			Not assembled
19			
20			
21	33,6	14,8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



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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	




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

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</i> 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		

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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.

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