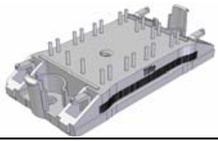
flowBOOST0 **600V/75A**

Features

- Symmetric boost
- Clip-In PCB mounting
- Low Inductance Layout

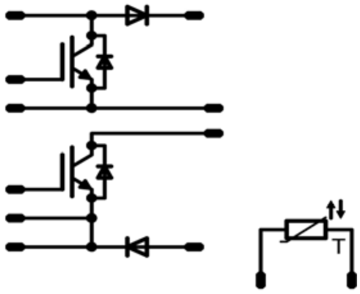
flow0 housing



Target Applications

- UPS

Schematic



Types

- 10-FZ06NBA075SA-P916L33

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Boost IGBT					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	$T_j=T_j$max	$T_h=80°C$ $T_c=80°C$	56 74	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by $T_j$max		225	A
Power dissipation per IGBT	P_{tot}	$T_j=T_j$max	$T_h=80°C$ $T_c=80°C$	93 141	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j≤150°C$ $V_{GE}=15V$		6 360	μs V
Maximum Junction Temperature	$T_j$max			175	°C
Input Boost Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	$T_j=25°C$		600	V
DC forward current	I_F	$T_j=T_j$max	$T_h=80°C$ $T_c=80°C$	33 44	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		90	A
Power dissipation per Diode	P_{tot}	$T_j=T_j$max	$T_h=80°C$ $T_c=80°C$	53 80	W
Maximum Junction Temperature	$T_j$max			175	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Input Boost FWD				
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C	600	V
DC forward current	I_F	T_j=$T_j$max T_h=80°C T_c=80°C	63 83	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max	120	A
Power dissipation	P_{tot}	T_j=$T_j$max T_h=80°C T_c=80°C	86 130	W
Maximum Junction Temperature	$T_j$max		175	°C
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{op}		-40…+(Tjmax - 25)	°C
Insulation Properties				
Insulation voltage	V_{is}	t=2s DC voltage	4000	V
Creepage distance			min 12,7	mm
Clearance			min 12,7	mm

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Input Boost IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0012	Tj=25°C Tj=150°C	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	Tj=25°C Tj=150°C	1	1,63 1,86	2,1	V
Collector-emitter cut-off	I_{CES}		0	600		Tj=25°C Tj=150°C			0,2	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=150°C			650	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=8 Ω Rgon=8 Ω	±15	300	75	Tj=25°C Tj=150°C		151 154		ns
Rise time	t_r					Tj=25°C Tj=150°C		20 24		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=150°C		209 233		
Fall time	t_f					Tj=25°C Tj=150°C		93 111		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=150°C		1,09 1,50		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=150°C		1,78 2,41		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		4620		pF
Output capacitance	C_{oss}							288		
Reverse transfer capacitance	C_{rss}							137		
Gate charge	Q_{Gate}	f=1MHz	0	25		Tj=25°C		470		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,02		K/W
Input Boost Inverse Diode										
Diode forward voltage	V_F				10	Tj=25°C Tj=125°C	1	1,63 1,56	2,05	V
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,8		K/W
Input Boost FWD										
Forward voltage	V_F				75	Tj=25°C Tj=125°C	1	1,49 1,46	2	V
Reverse leakage current	I_{rm}			600		Tj=25°C Tj=125°C			30	μA
Peak recovery current	I_{RRM}	Rgoff=8 Ω	±15	300	75	Tj=25°C Tj=125°C		70 86		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		117 152		ns
Reverse recovery charge	Q_{rr}					Tj=25°C Tj=125°C		3,07 6,19		μC
Reverse recovered energy	E_{rec}					Tj=25°C Tj=125°C		0,61 1,33		mWs
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		5142 2414		A/μs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,11		K/W
Thermistor										
Rated resistance	R					Tj=25°C		22000		Ω
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				Tj=100°C	-5		+5	%
Power dissipation	P					Tj=25°C		200		mW
Power dissipation constant						Tj=25°C		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				Tj=25°C		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				Tj=25°C		3996		K
Vincotech NTC Reference									B	

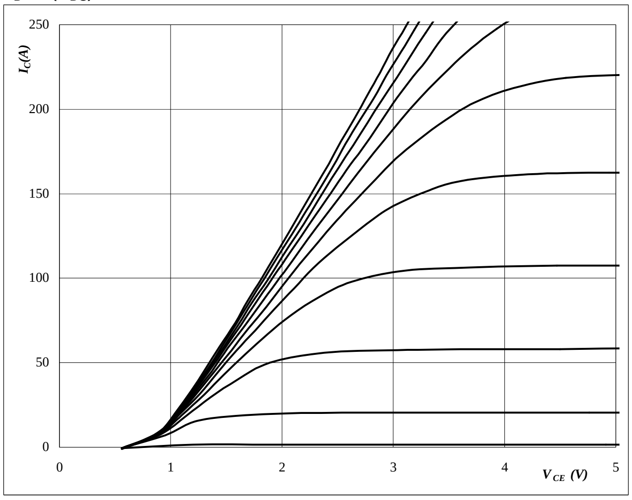
* see details on **Thermistor** charts on **Figure 2.**

INPUT BOOST

Figure 1 BOOST IGBT

Typical output characteristics

$I_D = f(V_{DS})$



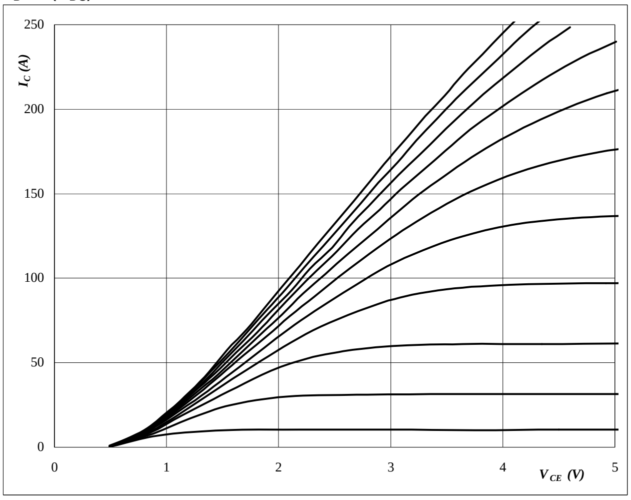
At

t_p =	250	µs
T_j =	25	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 2 BOOST IGBT

Typical output characteristics

$I_D = f(V_{DS})$



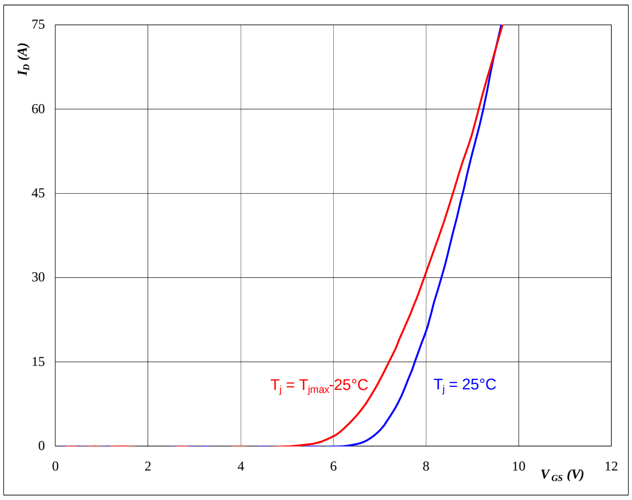
At

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

Figure 3 BOOST IGBT

Typical transfer characteristics

$I_D = f(V_{DS})$



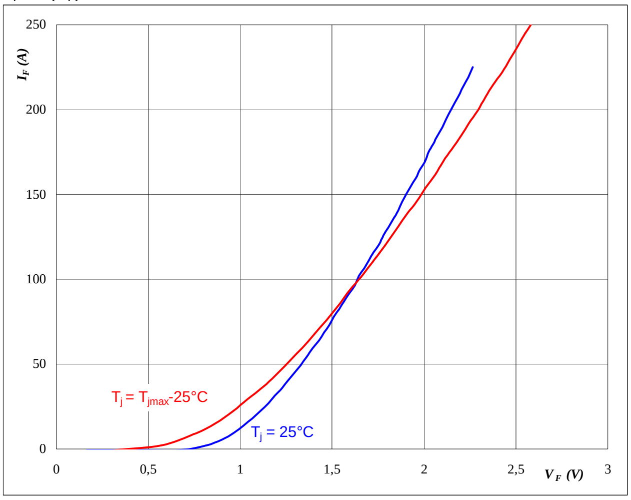
At

t_p =	250	µs
V_{CE} =	10	V

Figure 4 BOOST FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

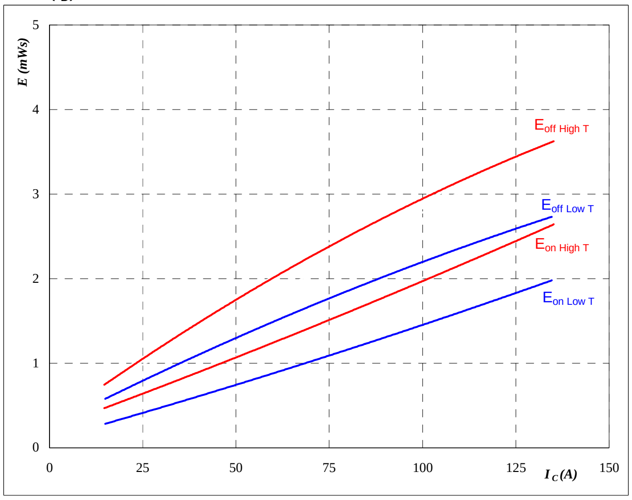
t_p =	250	µs

INPUT BOOST

Figure 5 BOOST IGBT

Typical switching energy losses
as a function of collector current

E = f(I_D)



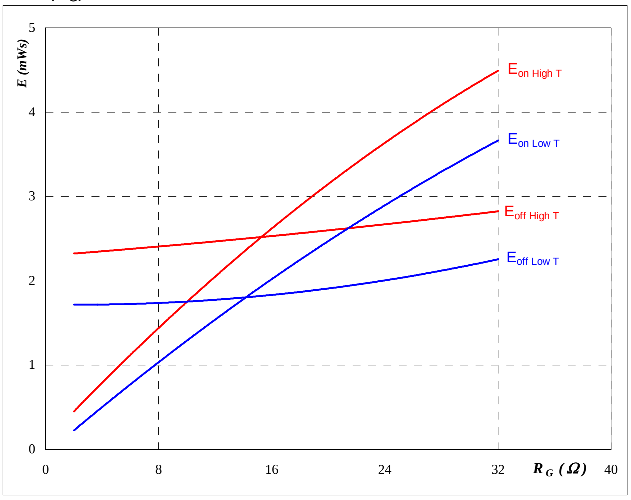
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GS} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

Figure 6 BOOST IGBT

Typical switching energy losses
as a function of gate resistor

E = f(R_G)



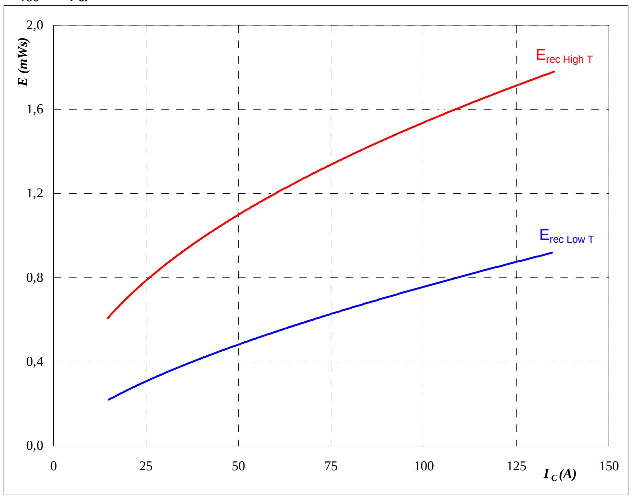
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GS} =	±15	V
I_C =	75	A

Figure 7 BOOST IGBT

Typical reverse recovery energy loss
as a function of collector (drain) current

E_{rec} = f(I_c)



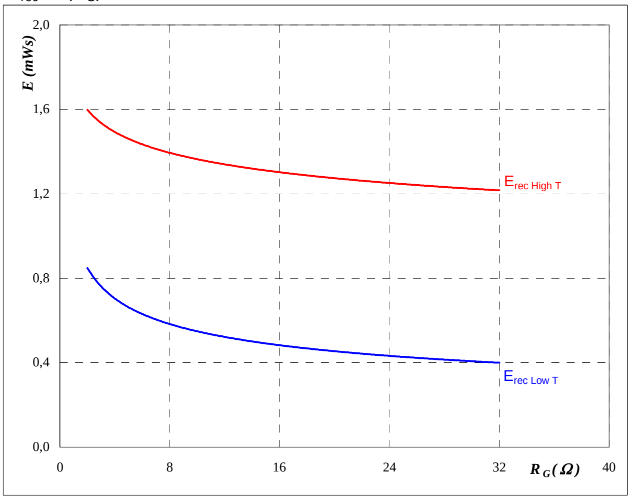
With an inductive load at

T_j =	25/150	°C
V_{DS} =	300	V
V_{GS} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

Figure 8 BOOST IGBT

Typical reverse recovery energy loss
as a function of gate resistor

E_{rec} = f(R_G)



With an inductive load at

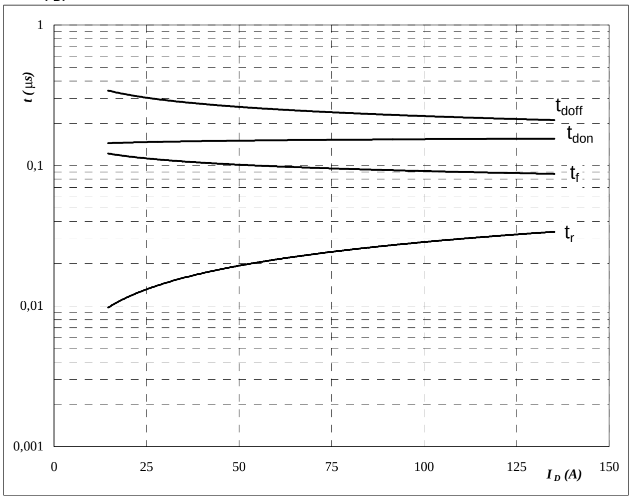
T_j =	25/150	°C
V_{DS} =	300	V
V_{GS} =	±15	V
I_D =	75	A

INPUT BOOST

Figure 9 BOOST IGBT

Typical switching times as a function of collector current

t = f(I_D)



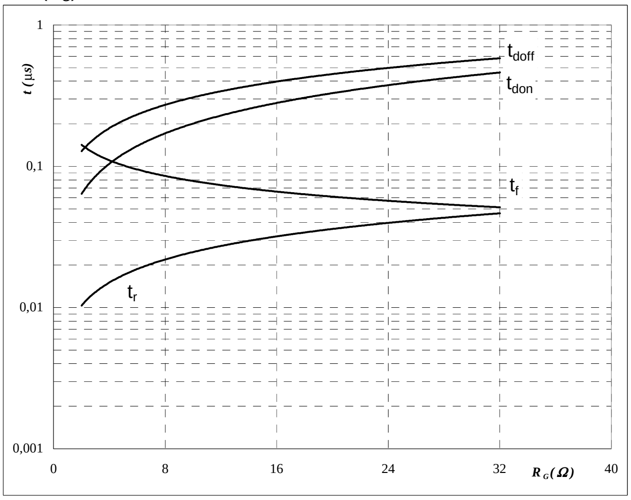
With an inductive load at

T_j =	150	°C
V_{DS} =	300	V
V_{GS} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8,015	Ω

Figure 10 BOOST IGBT

Typical switching times as a function of gate resistor

t = f(R_G)



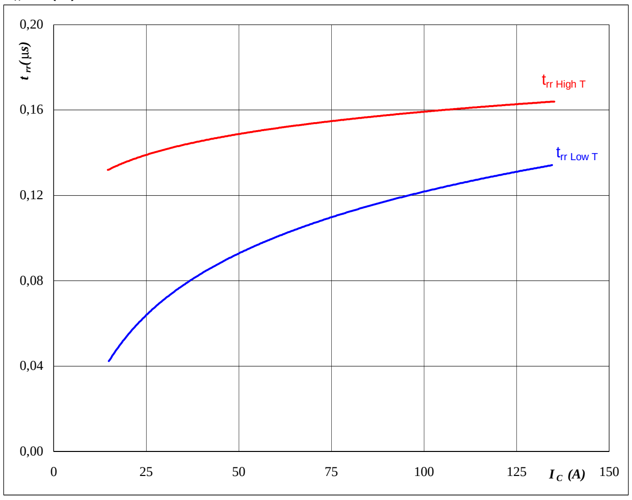
With an inductive load at

T_j =	150	°C
V_{DS} =	300	V
V_{GS} =	±15	V
I_C =	75	A

Figure 11 BOOST FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



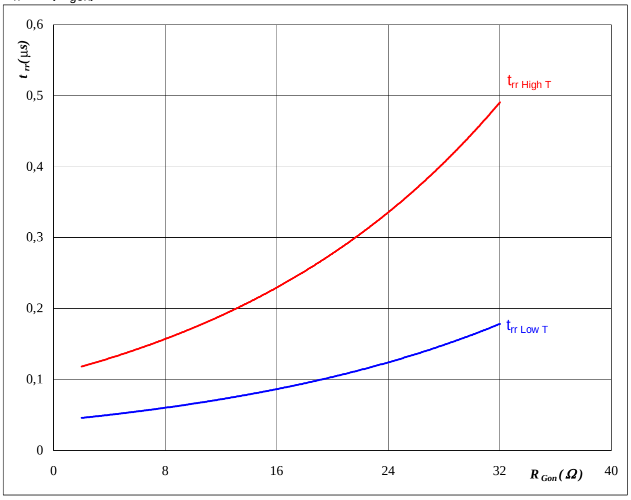
At

T_j =	25/150	°C
V_{DS} =	300	V
V_{GS} =	±15	V
R_{gon} =	8	Ω

Figure 12 BOOST FWD

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

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



At

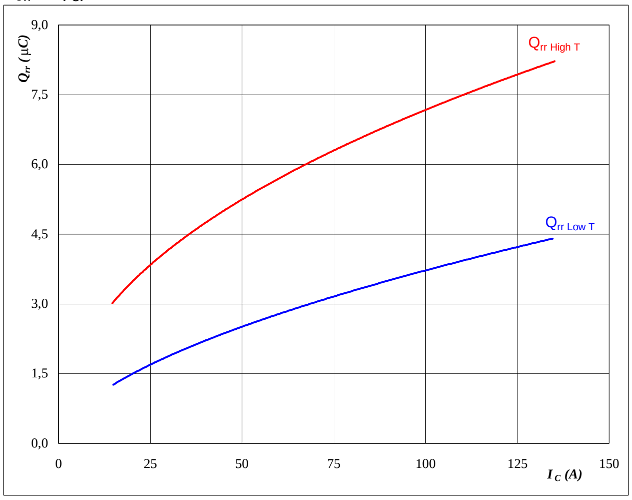
T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GS} =	±15	V

INPUT BOOST

Figure 13 BOOST FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



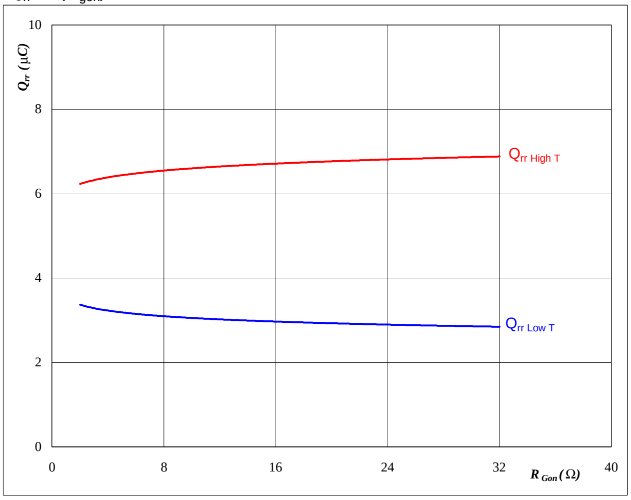
At

T_j =	25/150	°C
V_{DS} =	300	V
V_{GS} =	±15	V
R_{gon} =	8	Ω

Figure 14 BOOST FWD

Typical reverse recovery charge as a function of MOSFET turn on gate resistor

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



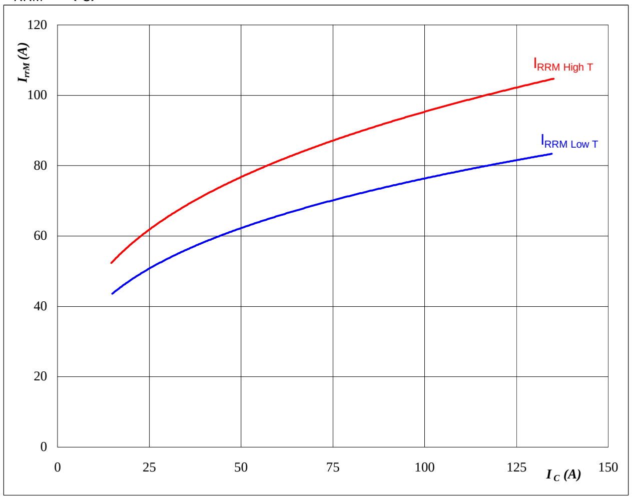
At

Tj =	25/150	°C
VR =	300	V
IF =	75	A
VGS =	±15	V

Figure 15 BOOST FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



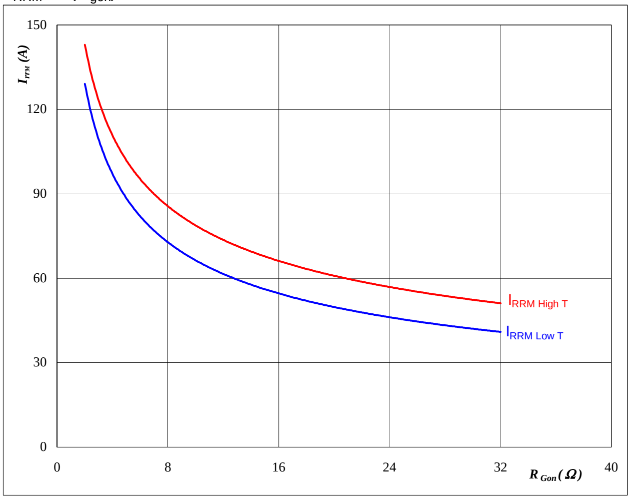
At

T_j =	25/150	°C
V_{DS} =	300	V
V_{GS} =	±15	V
R_{gon} =	8	Ω

Figure 16 BOOST FWD

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

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



At

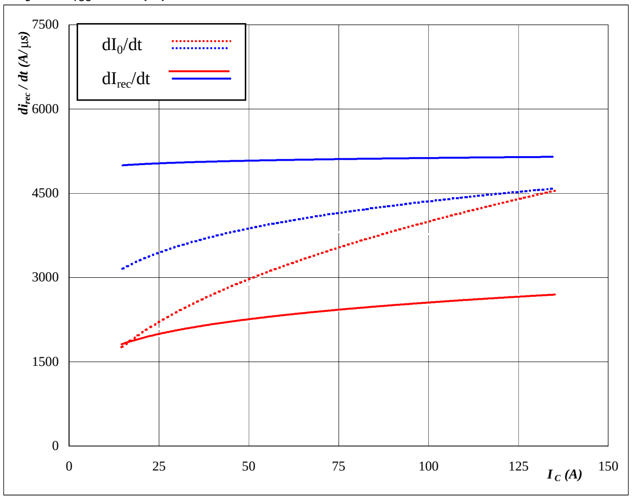
T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GS} =	±15	V

INPUT BOOST

Figure 17 BOOST FWD

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

$dI_0/dt, dI_{rec}/dt = f(Ic)$



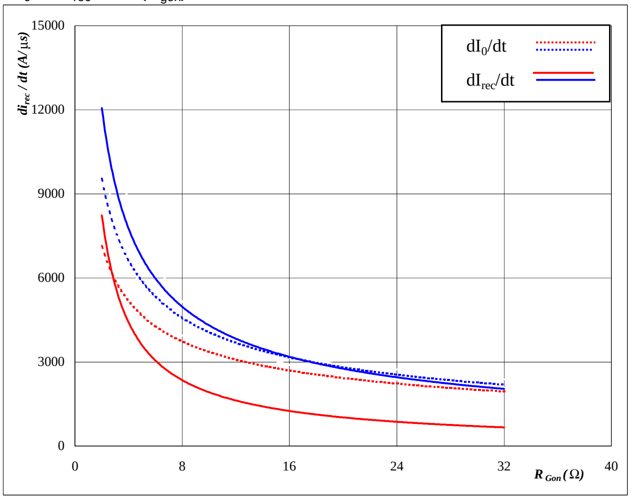
At

T_j = 25/150 °C
V_{CE} = 300 V
V_{GE} = ±15 V
R_{gon} = 8 Ω

Figure 18 BOOST FWD

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

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$



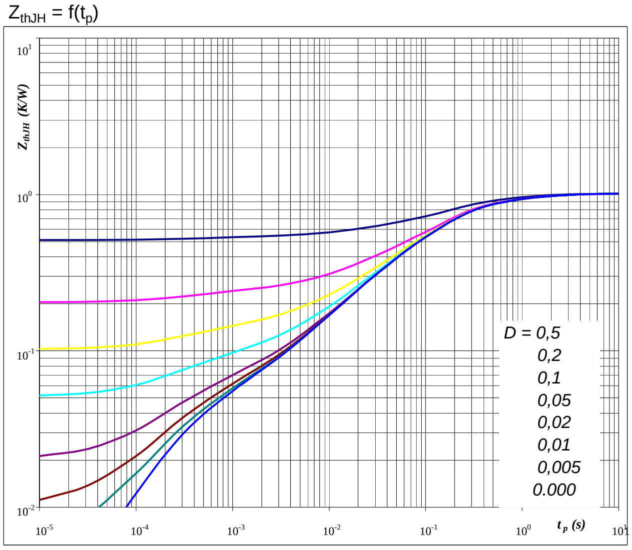
At

T_j = 25/150 °C
V_R = 300 V
I_F = 75 A
V_{GS} = ±15 V

Figure 19 BOOST IGBT

MOSFET transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D = t_p / T
R_{thJH} = 1,02 K/W

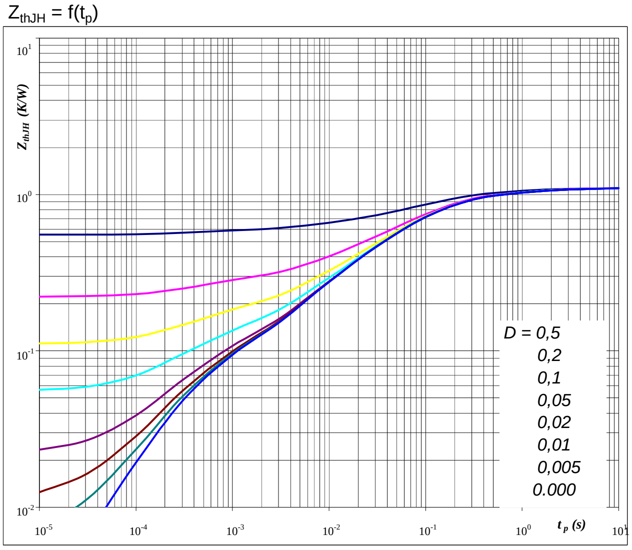
IGBT thermal model values

R (C/W)	Tau (s)
0,037	6,37E+00
0,176	8,57E-01
0,550	1,57E-01
0,179	2,60E-02
0,042	3,81E-03
0,037	3,09E-04

Figure 20 BOOST FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D = t_p / T
R_{thJH} = 1,11 K/W

FWD thermal model values

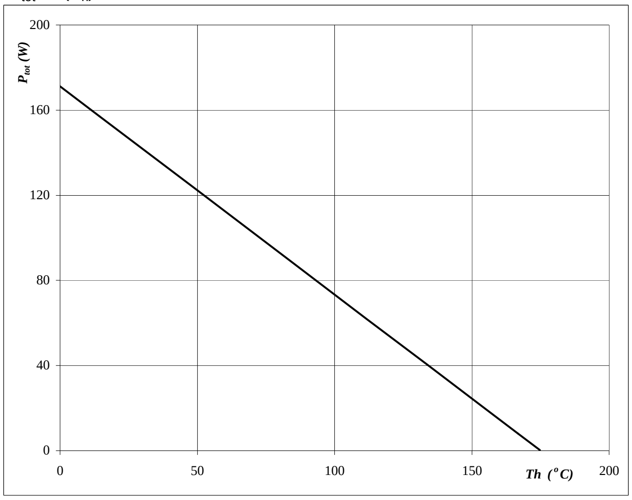
R (C/W)	Tau (s)
0,03	9,19E+00
0,13	9,97E-01
0,43	1,49E-01
0,33	3,47E-02
0,12	5,94E-03
0,07	3,69E-04

INPUT BOOST

Figure 21 BOOST IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



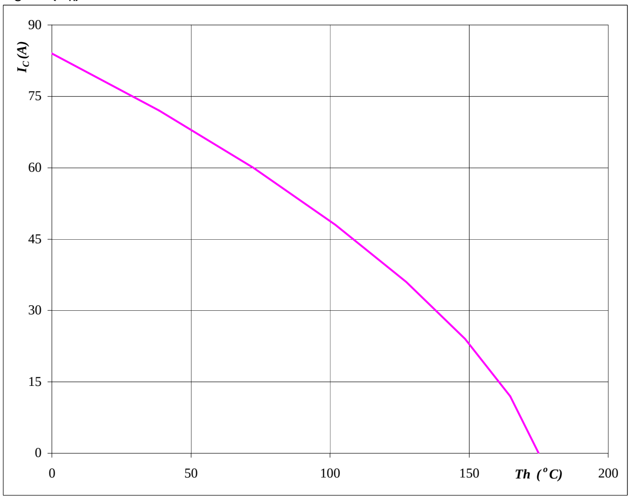
At

T_j = 175 ºC

Figure 22 BOOST IGBT

Collector/Drain current as a function of heatsink temperature

$I_C = f(T_h)$



At

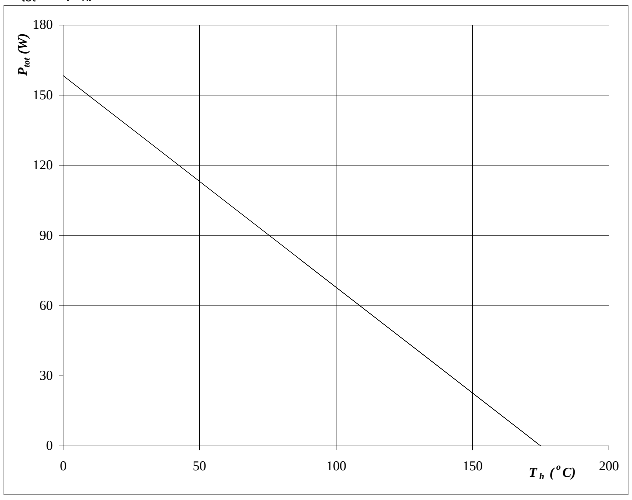
T_j = 175 ºC

V_{GS} = 15 V

Figure 23 BOOST FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



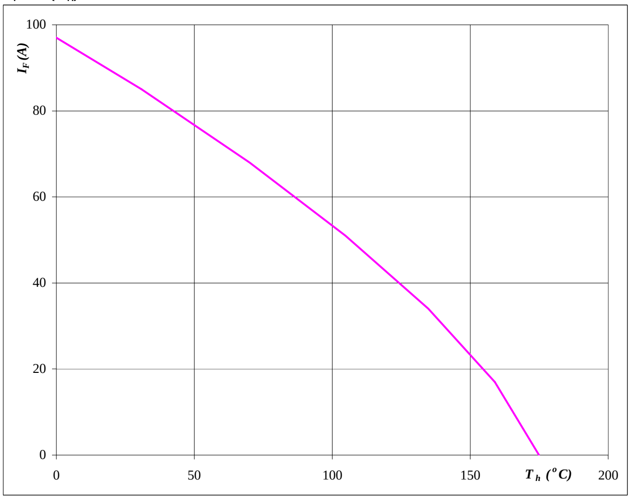
At

T_j = 175 ºC

Figure 24 BOOST FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

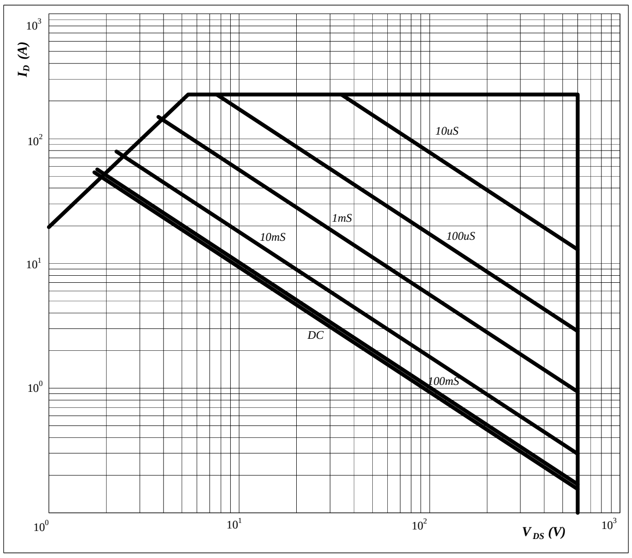
T_j = 175 ºC

INPUT BOOST

Figure 25	BOOST IGBT

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



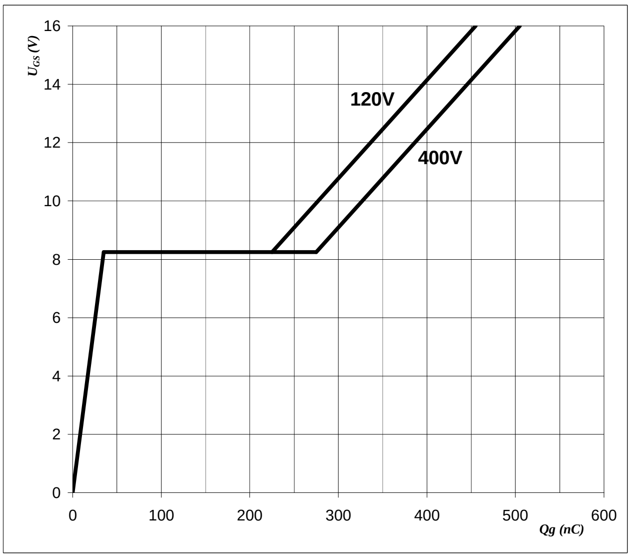
At

D =	single pulse	
T_h =	80	ºC
V_{GS} =	±15	V
T_j =	T_{jmax}	ºC

Figure 26	BOOST IGBT

Gate voltage vs Gate charge

$V_{GS} = f(Qg)$



At

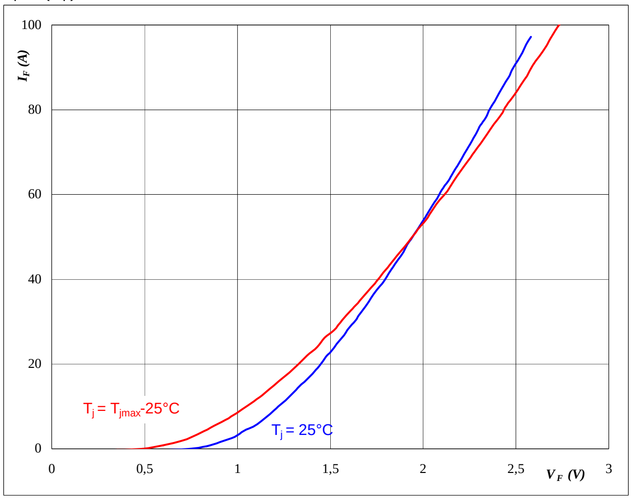
I_D =	75	A

BOOST INV. DIODE

Figure 1 BOOST INV. DIODE

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



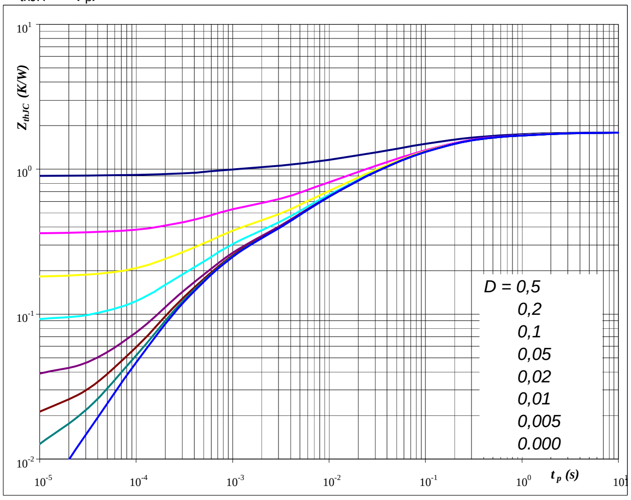
At

t_p =	250	μs

Figure 2 BOOST INV. DIODE

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



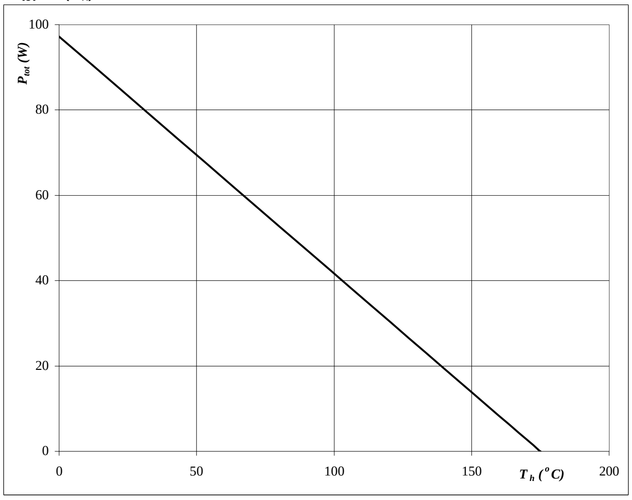
At

D =	t_p / T	
R_{thJH} =	1,800	K/W

Figure 3 BOOST INV. DIODE

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



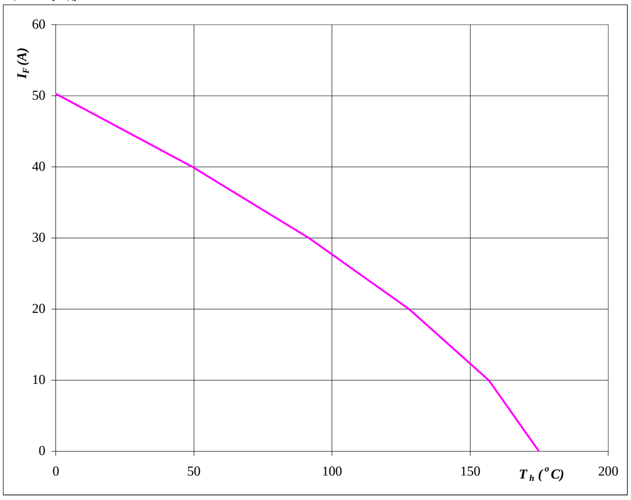
At

T_j =	175	ºC

Figure 4 BOOST INV. DIODE

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

T_j =	175	ºC

Thermistor

Figure 1 Thermistor

Typical NTC characteristic as a function of temperature

$R_T = f(T)$

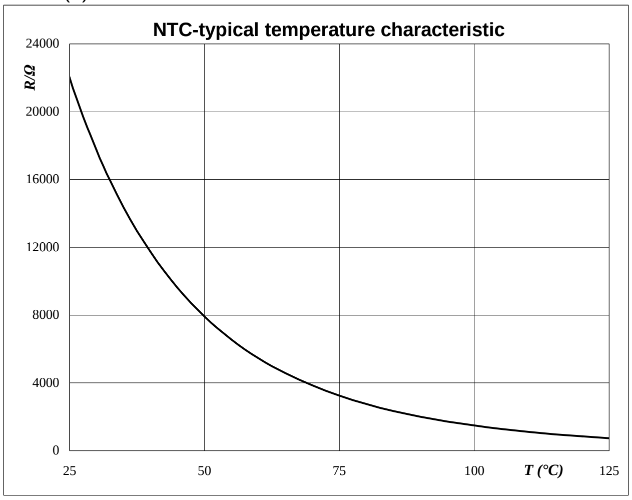


Figure 2 Thermistor

Typical NTC resistance values

$$R(T) = R_{25} \cdot e^{\left(B_{25/100} \cdot \left(\frac{1}{T} - \frac{1}{T_{25}}\right)\right)} \quad [\Omega]$$

T [°C]	R_{nom} [Ω]	R_{min} [Ω]	R_{max} [Ω]	△R/R [±%]
-55	2089434,5	1506495,4	2672373,6	27,9
0	71804,2	59724,4	83884	16,8
10	43780,4	37094,4	50466,5	15,3
20	27484,6	23684,6	31284,7	13,8
25	22000	19109,3	24890,7	13,1
30	17723,3	15512,2	19934,4	12,5
60	5467,9	4980,6	5955,1	8,9
70	3848,6	3546	4151,1	7,9
80	2757,7	2568,2	2947,1	6,9
90	2008,9	1889,7	2128,2	5,9
100	**1486,1**	**1411,8**	**1560,4**	**5**
150	400,2	364,8	435,7	8,8

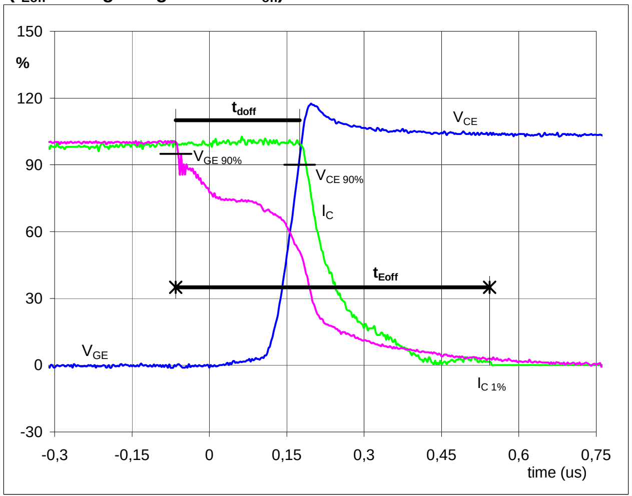
Switching Definitions Boost IGBT

General conditions

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

Figure 1 BOOST IGBT

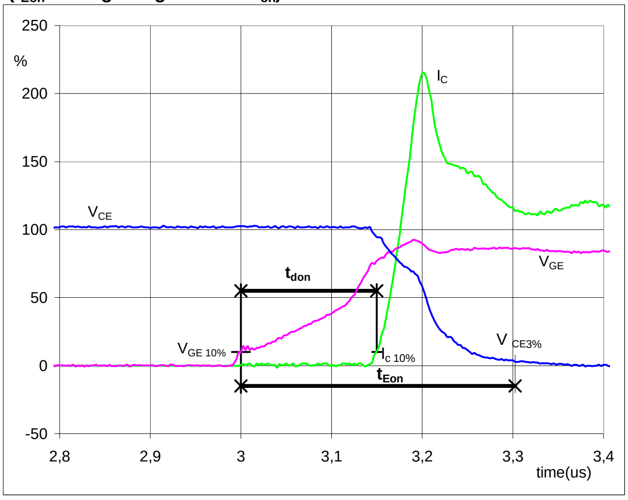
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	74	A
t_{doff} =	0,23	µs
t_{Eoff} =	0,61	µs

Figure 2 BOOST IGBT

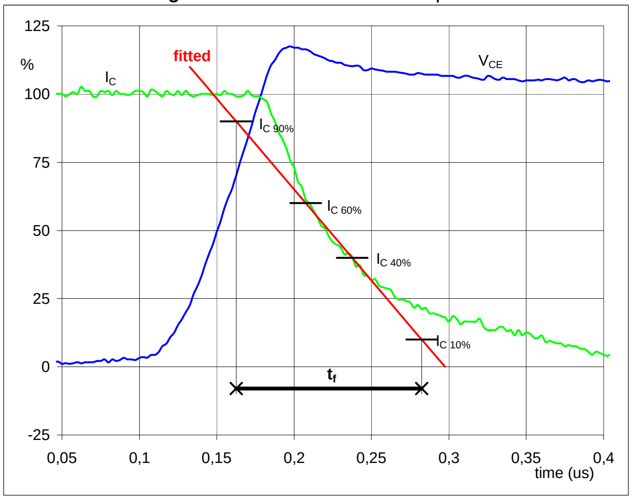
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	74	A
t_{don} =	0,15	µs
t_{Eon} =	0,30	µs

Figure 3 BOOST IGBT

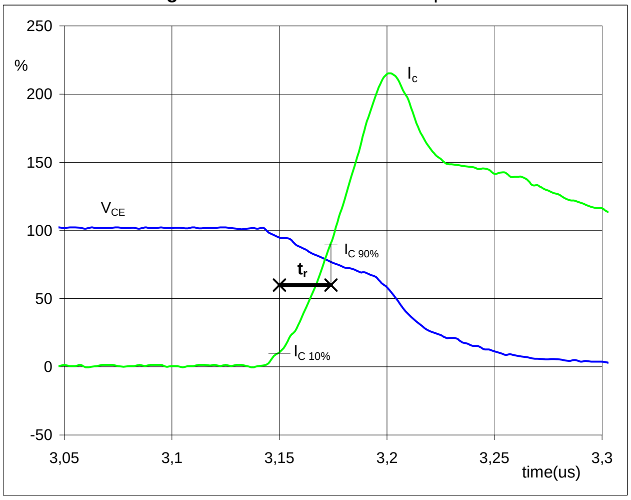
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	300	V
I_C (100%) =	74	A
t_f =	0,11	µs

Figure 4 BOOST IGBT

Turn-on Switching Waveforms & definition of t_r

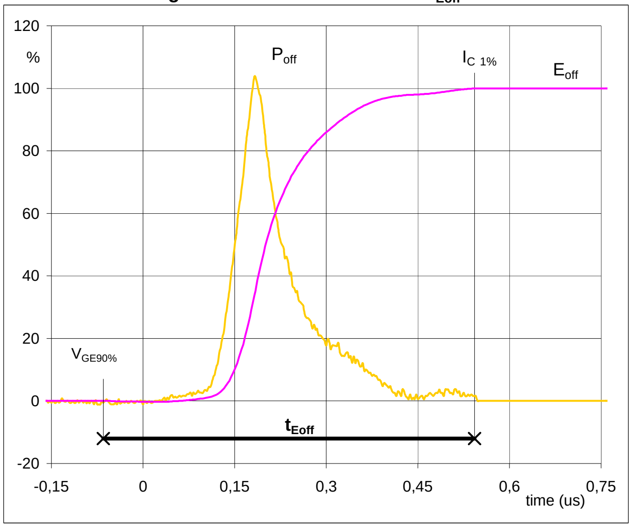


V_C (100%) =	300	V
I_C (100%) =	74	A
t_r =	0,02	µs

Switching Definitions Boost IGBT

Figure 5 BOOST IGBT

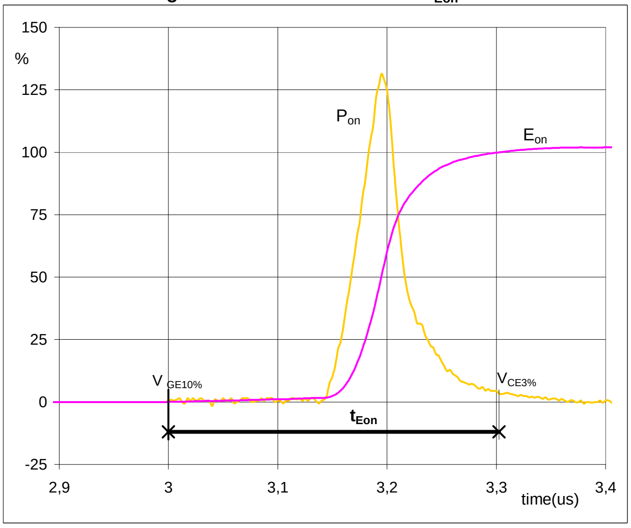
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	22,30	kW
E_{off} (100%) =	2,41	mJ
t_{Eoff} =	0,61	μs

Figure 6 BOOST IGBT

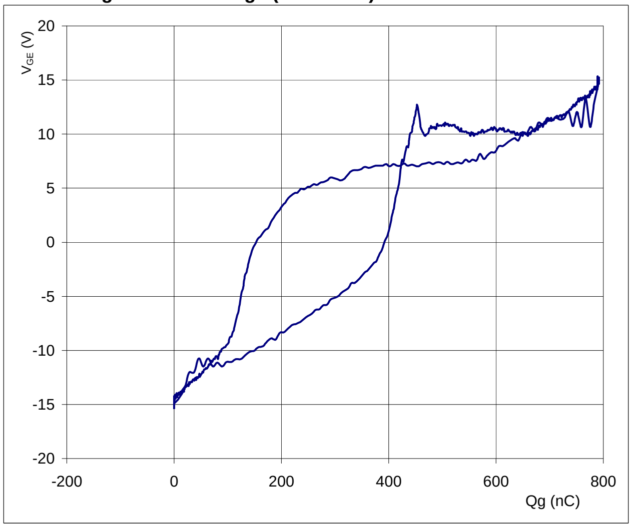
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	22,30	kW
E_{on} (100%) =	1,50	mJ
t_{Eon} =	0,30	μs

Figure 7 BOOST IGBT

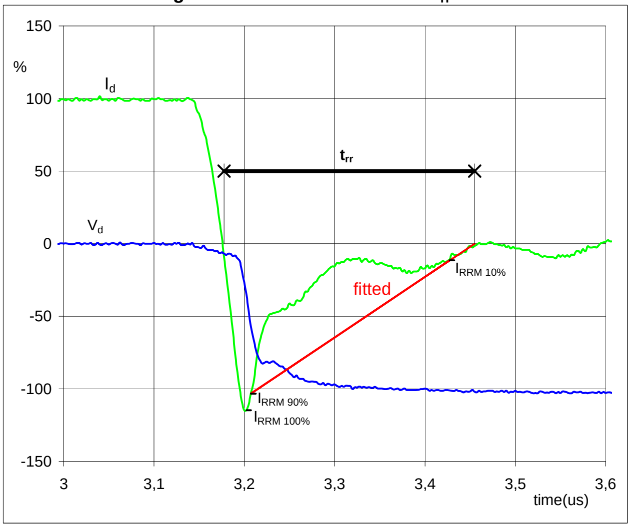
Gate voltage vs Gate charge (measured)



V_{GEoff} =	-15	V
V_{GEon} =	15	V
V_C (100%) =	300	V
I_C (100%) =	74	A
Q_g =	794,04	nC

Figure 8 BOOST FWD

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

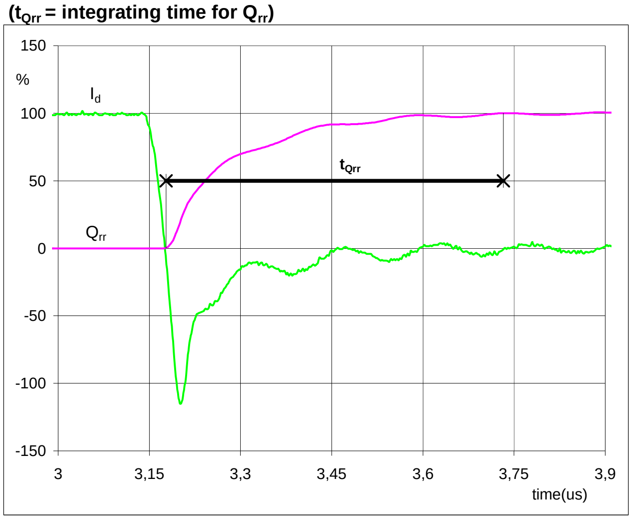


V_d (100%) =	300	V
I_d (100%) =	74	A
I_{RRM} (100%) =	-86	A
t_{rr} =	0,15	μs

Switching Definitions Boost IGBT

Figure 9 BOOST FWD

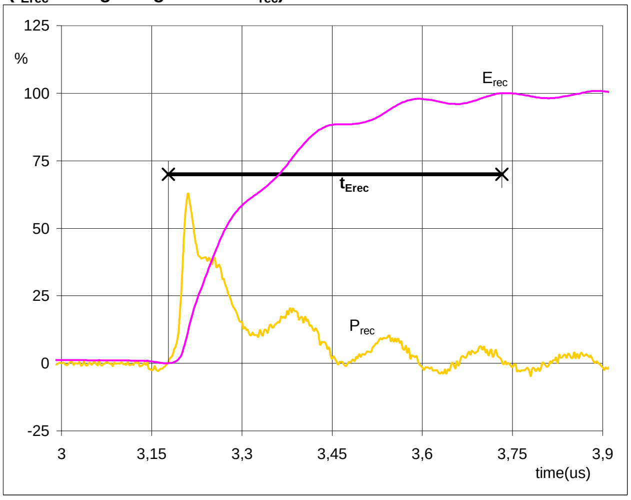
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	74	A
Q_{rr} (100%) =	6,19	μC
t_{Qrr} =	0,55	μs

Figure 10 BOOST FWD

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



P_{rec} (100%) =	22,30	kW
E_{rec} (100%) =	1,33	mJ
t_{Erec} =	0,55	μs

Measurement circuits

Figure 11

BUCK stage switching measurement circuit

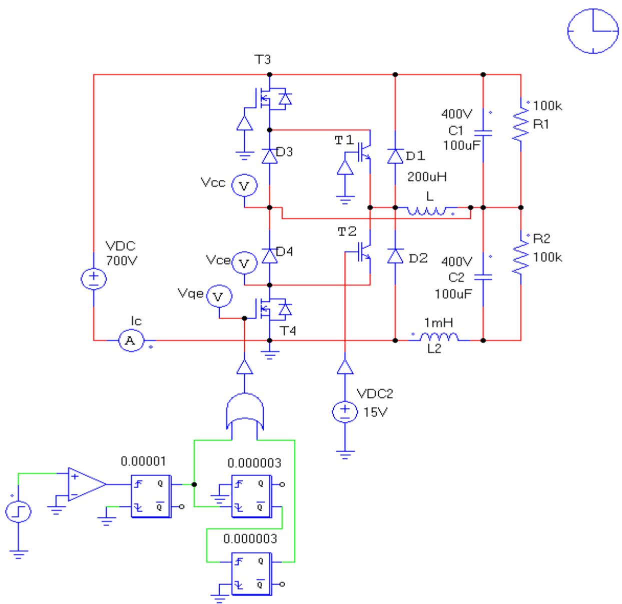
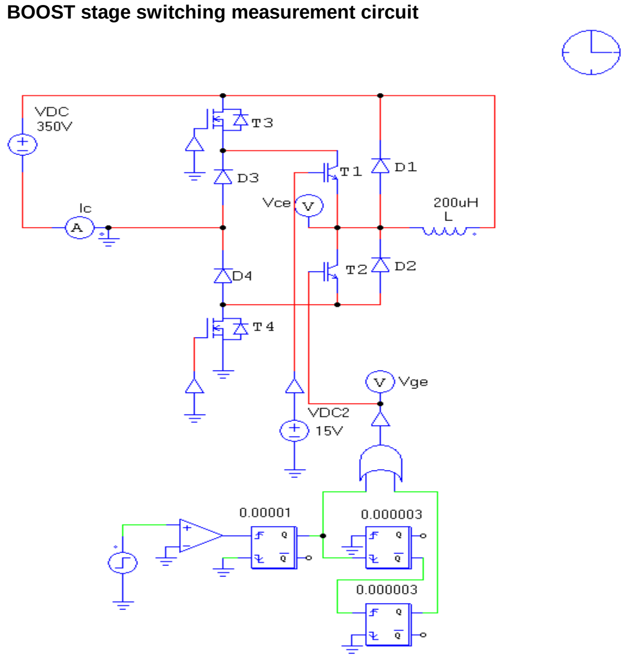


Figure 12

BOOST stage switching measurement circuit



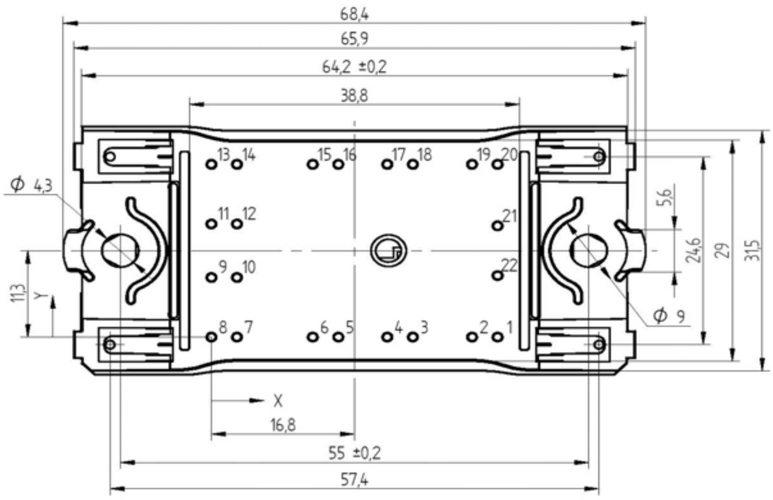
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

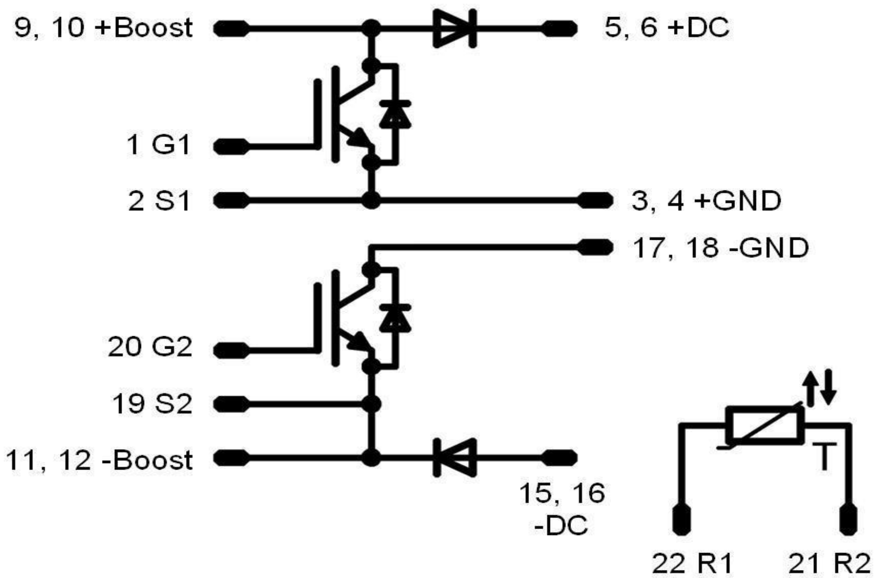
Version	Ordering Code	in DataMatrix as	in packaging barcode as
Standard in flow0 12mm housing	10-FZ06NBA075SA-P916L33	P916L33	P916L33

Outline

Pin table		
Pin	X	Y
1	33,6	0
2	30,6	0
3	23,65	0
4	20,65	0
5	14,9	0
6	11,9	0
7	3	0
8	0	0
9	0	7,8
10	3	7,8
11	0	14,8
12	3	14,8
13	0	22,6
14	3	22,6
15	11,9	22,6
16	14,9	22,6
17	20,65	22,6
18	23,65	22,6
19	30,6	22,6
20	33,6	22,6
21	33,6	14,55
22	33,6	8,05



Pinout



PRODUCT STATUS DEFINITIONS

Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data may be published at a later date. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.
Final	Full Production	This datasheet contains final specifications. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.

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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.