flow BOOST 2	600 V / 200 A

Features

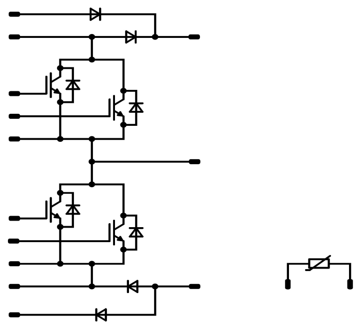
- High efficiency symmetric boost
- Ultra fast switching frequency
- Low Inductance Layout

flow 2 17mm housing

Target Applications

- Solar inverter

Schematic



Types

- 30-F206NBA200SG-M235L25

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Bypass Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
Forward current	I_{FAV}	DC current	T_s = 80 °C	130	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms		2000	A
I^2t-value	I^2t			13600	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	209	W
Maximum Junction Temperature	T_{jmax}			150	°C
Input Boost IGBT					
Collector-emitter breakdown voltage	V_{CE}			600	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	140	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		800	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	297	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		5 400	μs V
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Boost Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	70	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		200	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	154	W
Maximum Junction Temperature	T_{jmax}			175	°C
Input Boost Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	166	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		240	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	226	W
Maximum Junction Temperature	T_{jmax}			150	°C
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{is}	t = 2 s	DC Test Voltage *	6000	V
		t = 1 min	AC Voltage	2500	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm

* 100% tested in production

Characteristic Values

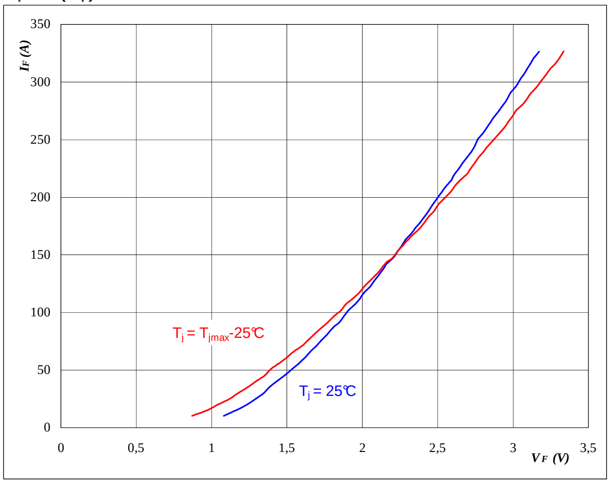
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Bypass Diode										
Forward voltage	V_F				200	25 125		1,17 1,11	1,21	V
Threshold voltage (for power loss calc. only)	V_{to}				200	25 125		0,95 0,75		V
Slope resistance (for power loss calc. only)	r_t				200	25 125		0,002 0,003		Ω
Reverse current	I_r			1600		25			0,1	mA
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,33		K/W
Input Boost IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$				0,0032	25	4,2	5,1	5,6	V
Collector-emitter saturation voltage	V_{CEsat}		±15		200	25 150	1,38	2,10 2,41	2,22	V
Collector-emitter cut-off	I_{CES}		0	600		25			0,011	mA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	350	200	25 150		53 50		ns
Rise time	t_r					25 150		46 47		
Turn-off delay time	$t_{d(off)}$					25 150		616 666		
Fall time	t_f					25 150		33 26		
Turn-on energy loss	E_{on}					25 150		5,38 7,28		mWs
Turn-off energy loss	E_{off}					25 150		4,56 5,16		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		12400		pF
Output capacitance	C_{oes}							464		
Reverse transfer capacitance	C_{res}							360		
Gate charge	Q_G		±15	480	200	25		1260		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,32		K/W
Input Boost Inverse Diode										
Diode forward voltage	V_F				200	25 125	1,2	1,90 1,84	1,9	V
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,62		K/W
Input Boost Diode										
Forward voltage	V_F				240	25 125		2,27 1,96	2,8	V
Reverse leakage current	I_{rm}		±15	350	200	25			80	µA
Peak recovery current	I_{RRM}	R_{gon} = 4 Ω	±15	350	200	25 125		79 144		A
Reverse recovery time	t_{rr}					25 125		34 122		ns
Reverse recovery charge	Q_{rr}					25 125		2,03 8,32		µC
Reverse recovered energy	E_{rec}					25 125		0,22 1,25		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		5246 3886		A/µs
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						0,42		K/W
Thermistor										
Rated resistance	R					25		22000		Ω
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	

Input BOOST Inverse Diode

figure 25. **Boost Inverse Diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



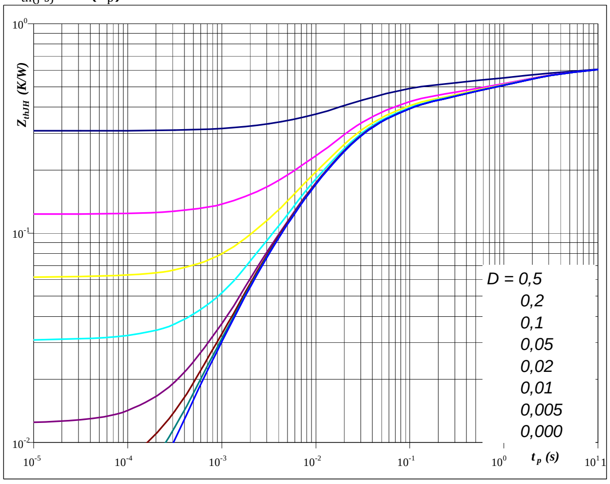
At

t_p = 250 µs

figure 26. **Boost Inverse Diode**

Diode transient thermal impedance as a function of pulse width

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



At

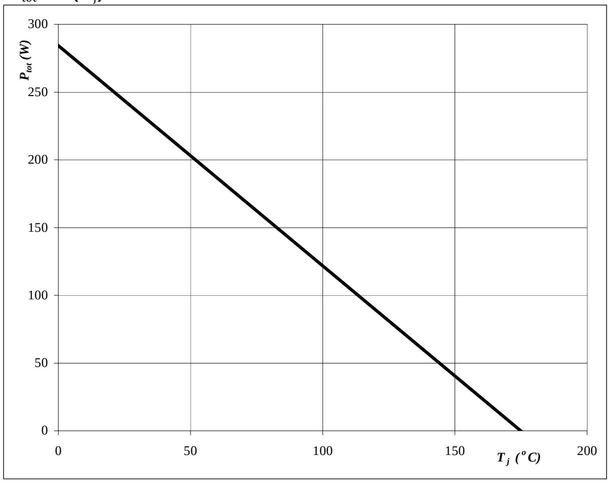
D = t_p / T

$R_{th(j-s)}$ = 0,62 K/W

figure 27. **Boost Inverse Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_j)$



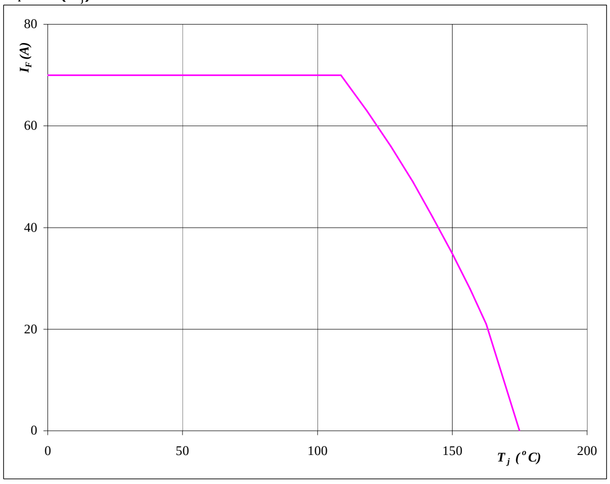
At

T_j = 175 ºC

figure 28. **Boost Inverse Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_j)$



At

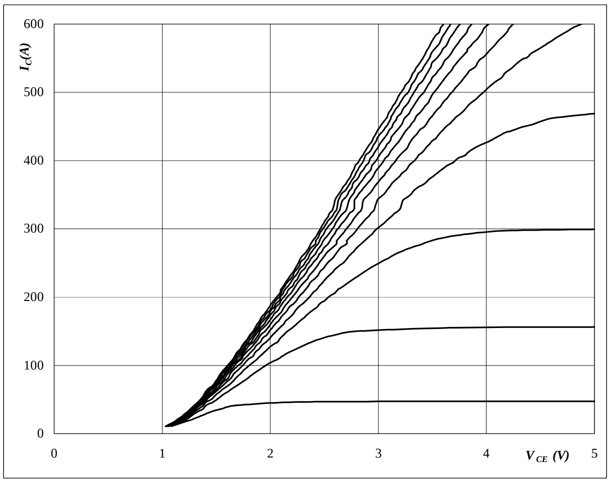
T_j = 175 ºC

INPUT BOOST

figure 1. **IGBT**

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

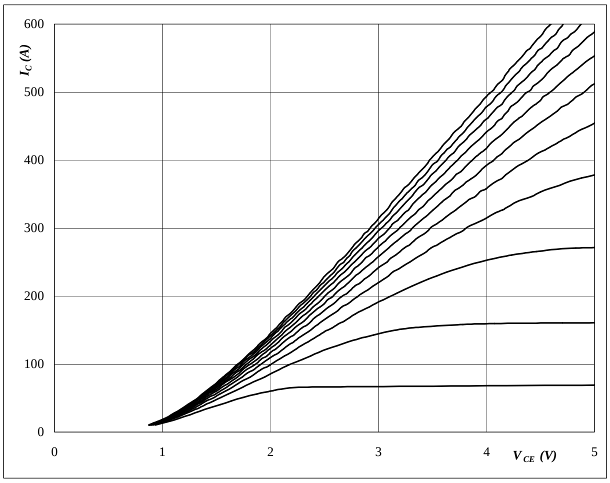
T_j = 25 °C

V_{GS} from 7 V to 17 V in steps of 1 V

figure 2. **IGBT**

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

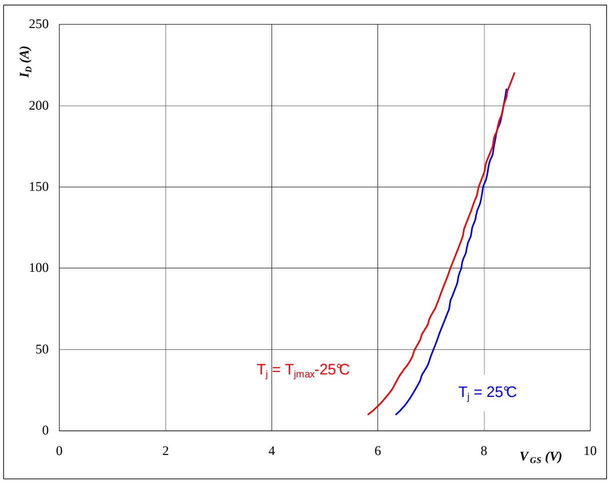
T_j = 125 °C

V_{GS} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_D = f(V_{GS})$



At

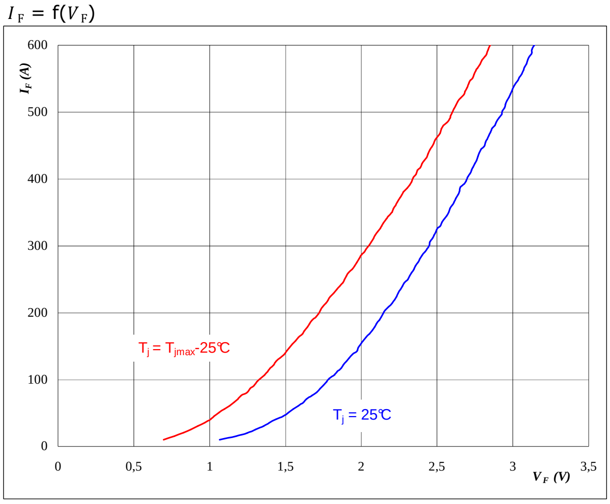
t_p = 250 µs

V_{DS} = 10 V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

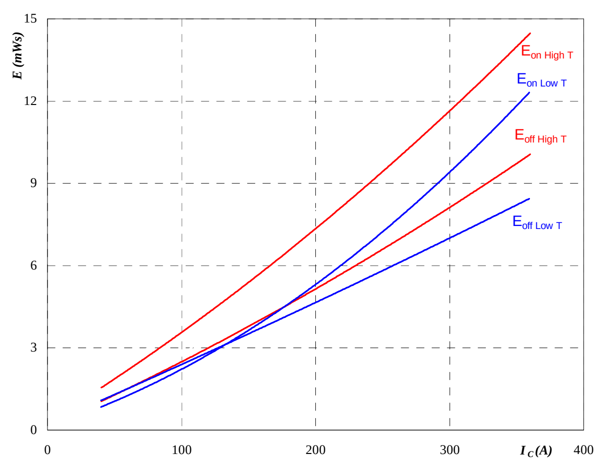
t_p = 250 µs

INPUT BOOST

figure 5.	IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_D)$



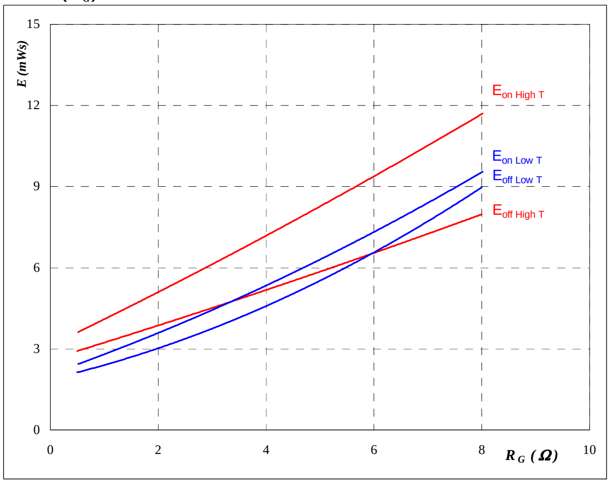
With an inductive load at

T_j =	25/125	°C
V_{DS} =	350	V
V_{GS} =	15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6.	IGBT

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



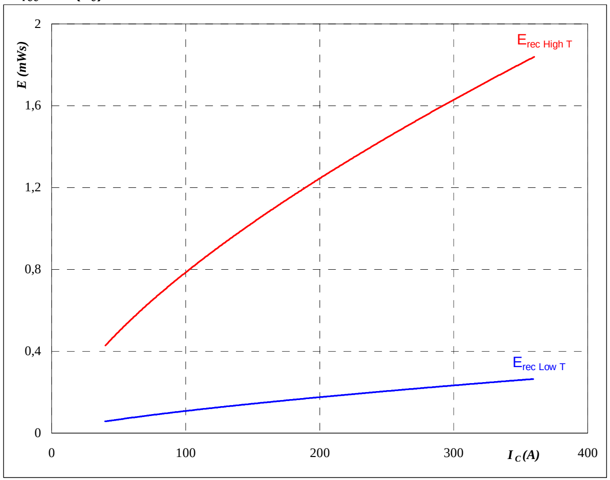
With an inductive load at

T_j =	25/125	°C
V_{DS} =	350	V
V_{GS} =	15	V
I_D =	200	A

figure 7.	FWD

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

$E_{rec} = f(I_c)$



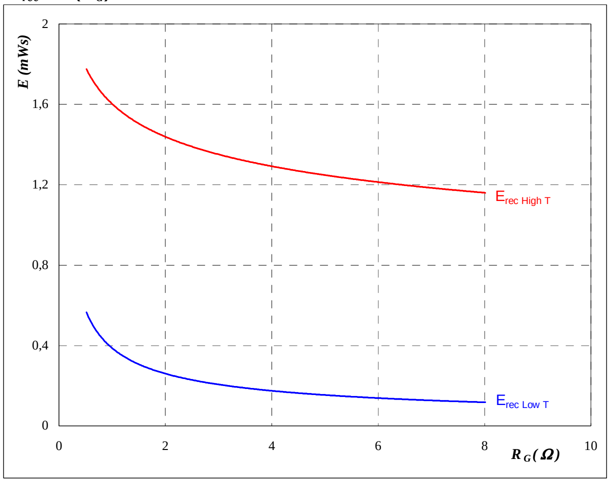
With an inductive load at

T_j =	25/125	°C
V_{DS} =	350	V
V_{GS} =	15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 8.	FWD

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

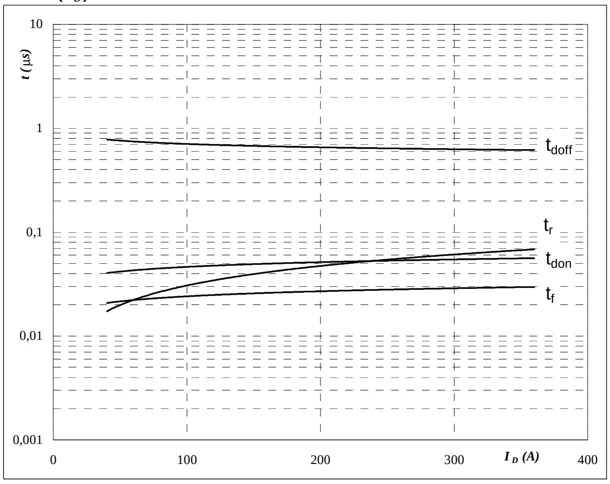
T_j =	25/125	°C
V_{DS} =	350	V
V_{GS} =	15	V
I_D =	200	A

INPUT BOOST

figure 9.	**IGBT**

Typical switching times as a function of collector current

$t = f(I_D)$



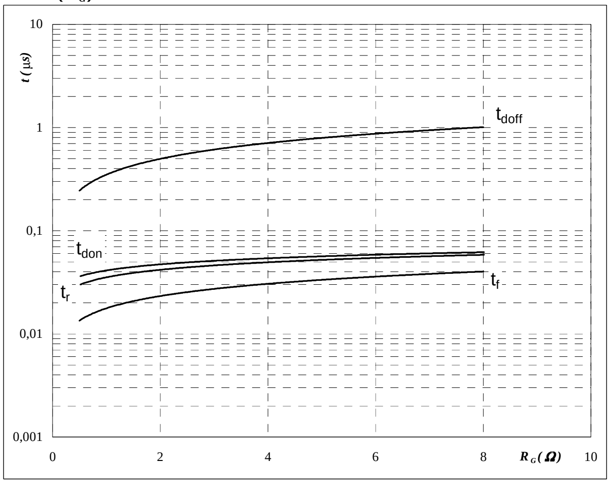
With an inductive load at

T_j =	125	°C
V_{DS} =	350	V
V_{GS} =	15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 10.	**IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



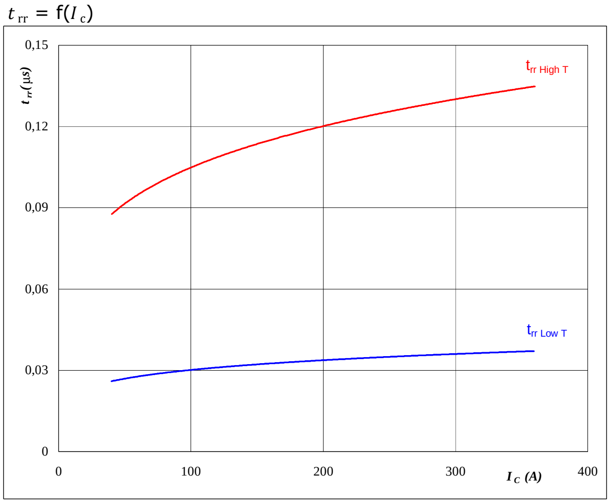
With an inductive load at

T_j =	125	°C
V_{DS} =	350	V
V_{GS} =	15	V
I_C =	200	A

figure 11.	**FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_c)$



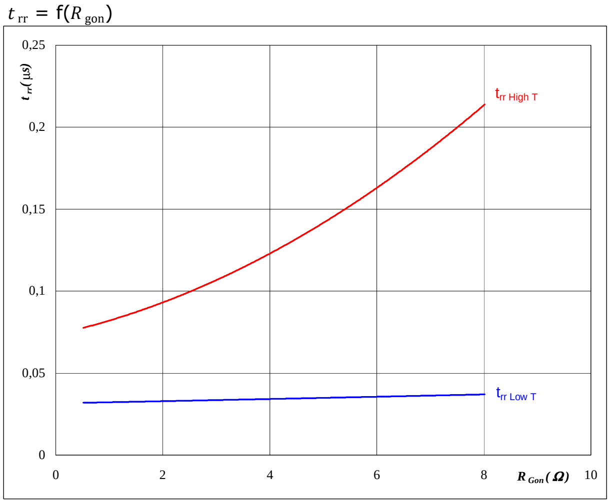
At

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

figure 12.	**FWD**

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

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



At

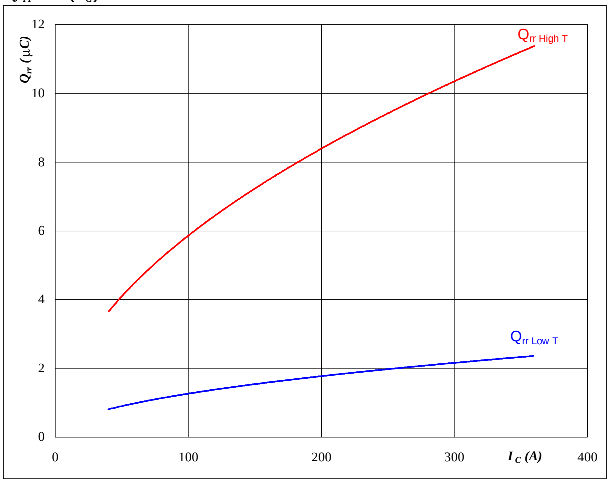
T_j =	25/125	°C
V_R =	350	V
I_F =	200	A
V_{GS} =	15	V

INPUT BOOST

figure 13. **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



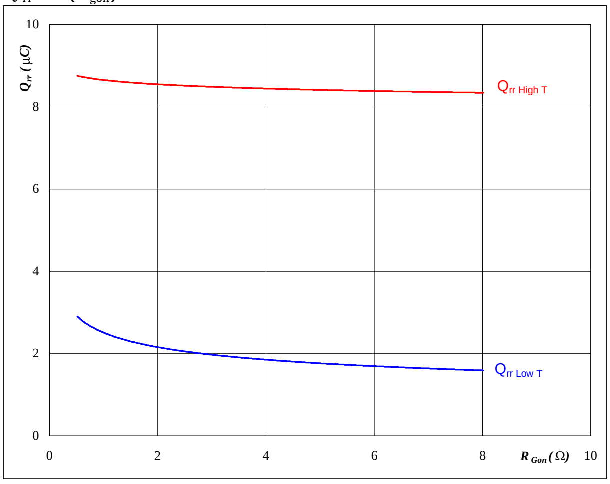
At

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

figure 14. **FWD**

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

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



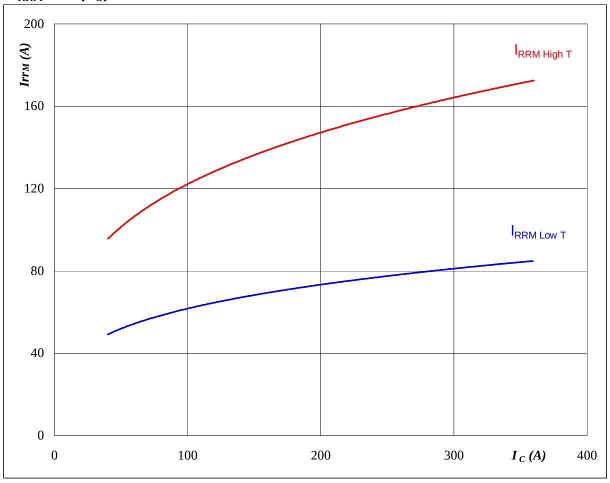
At

T_j =	25/125	°C
V_R =	350	V
I_F =	200	A
V_{GS} =	15	V

figure 15. **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



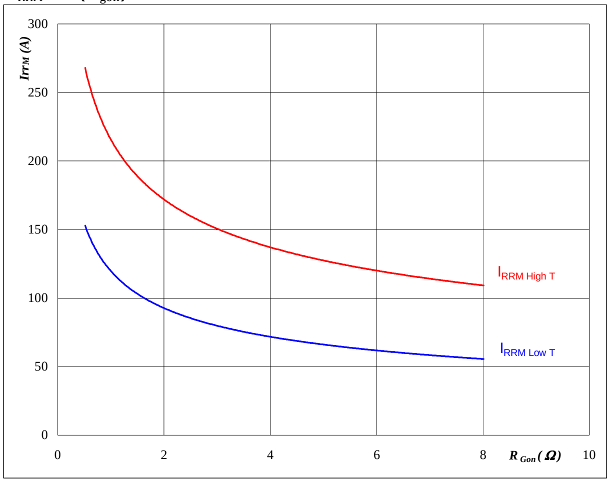
At

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

figure 16. **FWD**

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

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



At

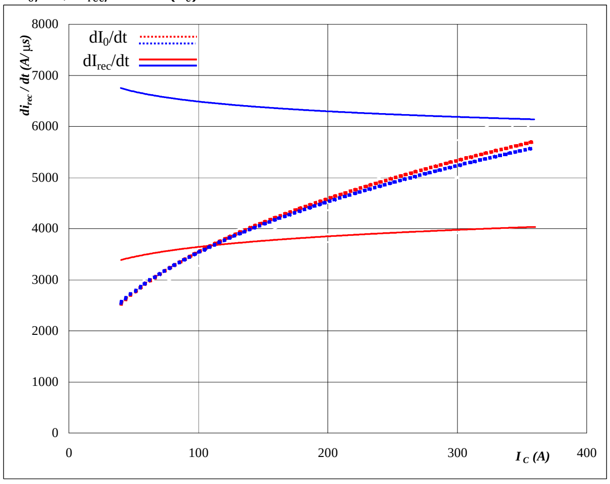
T_j =	25/125	°C
V_R =	350	V
I_F =	200	A
V_{GS} =	15	V

INPUT BOOST

figure 17. **FWD**

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

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



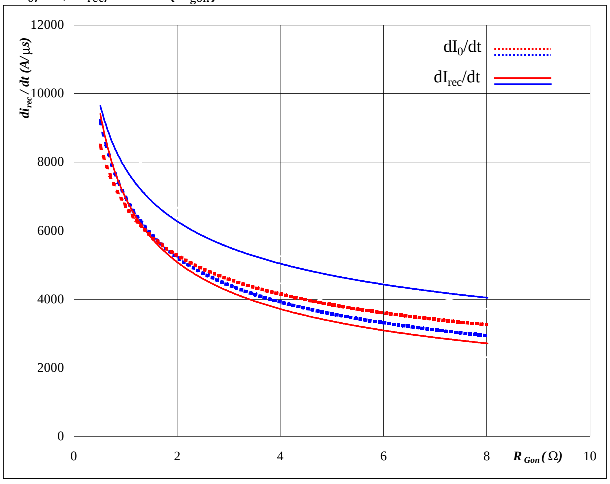
At

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

figure 18. **FWD**

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

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



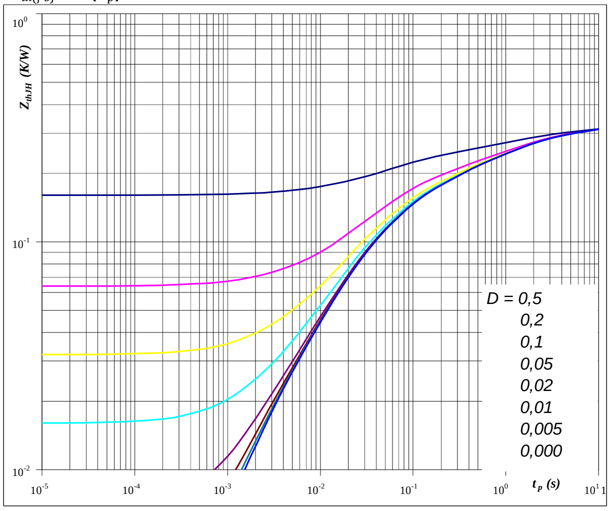
At

T_j =	25/125	°C
V_R =	350	V
I_F =	200	A
V_{GS} =	15	V

figure 19. **IGBT**

IGBT/MOSFET transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	0,32	K/W

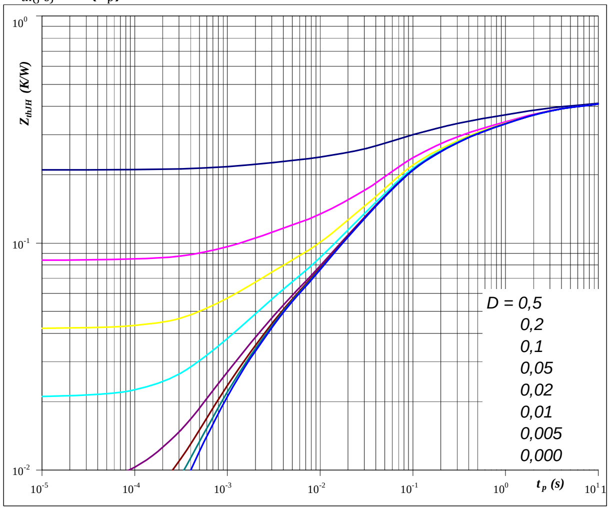
IGBT thermal model values

R (K/W)	Tau (s)
3,80E-02	6,34E+00
7,45E-02	1,65E+00
5,88E-02	3,72E-01
6,30E-02	8,42E-02
7,23E-02	2,60E-02
1,31E-02	3,72E-03

figure 20. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j\text{-}s)}$ =	0,42	K/W

FWD thermal model values

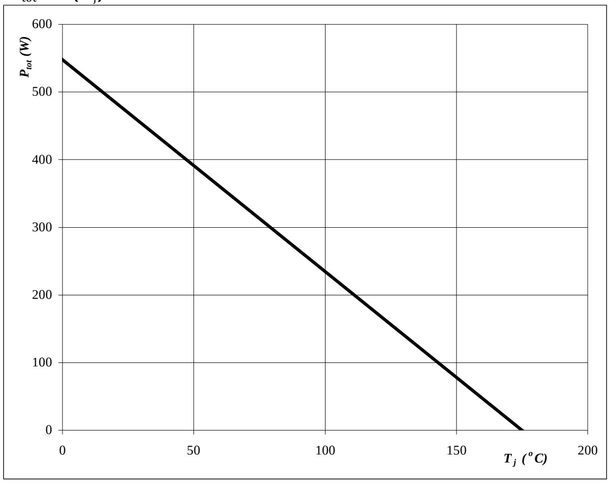
R (K/W)	Tau (s)
2,51E-02	9,71E+00
8,11E-02	2,16E+00
7,23E-02	5,30E-01
8,79E-02	1,27E-01
1,05E-01	3,93E-02
2,58E-02	5,33E-03

INPUT BOOST

figure 21. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_j)$



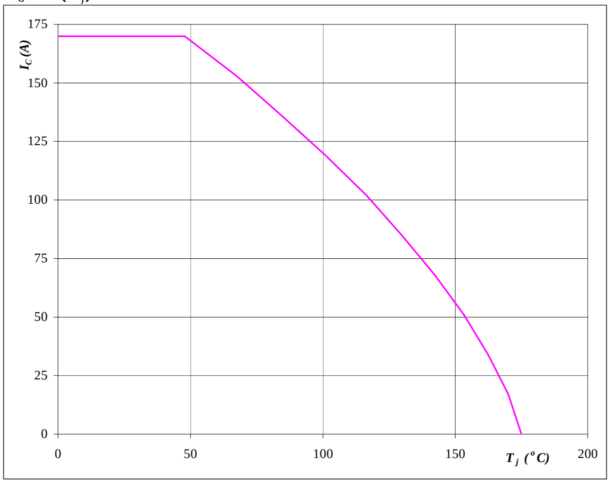
At

T_j = 175 ºC

figure 22. **IGBT**

Collector/Drain current as a function of heatsink temperature

$I_C = f(T_j)$



At

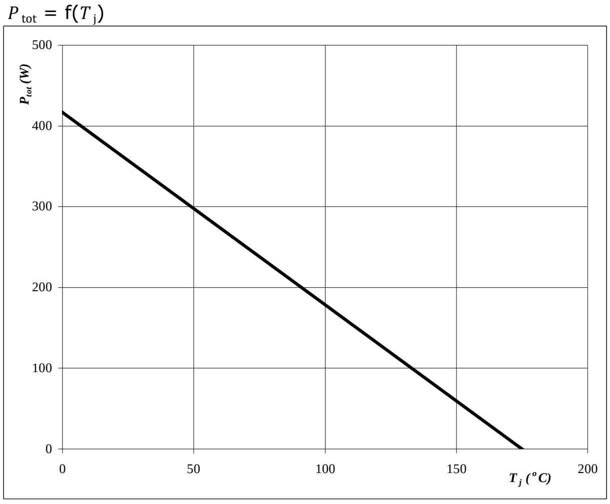
T_j = 175 ºC

V_{GS} = 15 V

figure 23. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_j)$



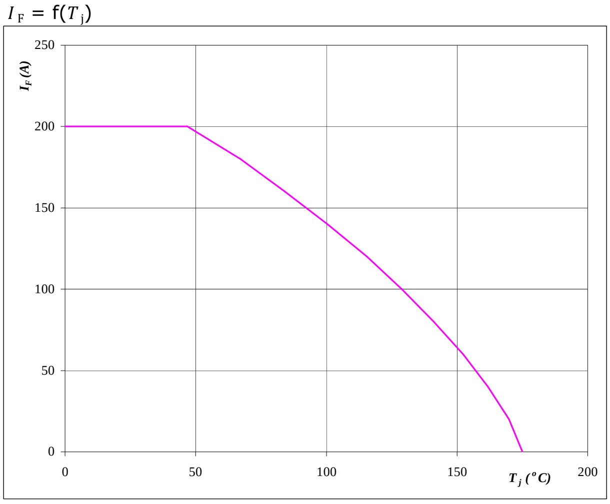
At

T_j = 175 ºC

figure 24. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_j)$



At

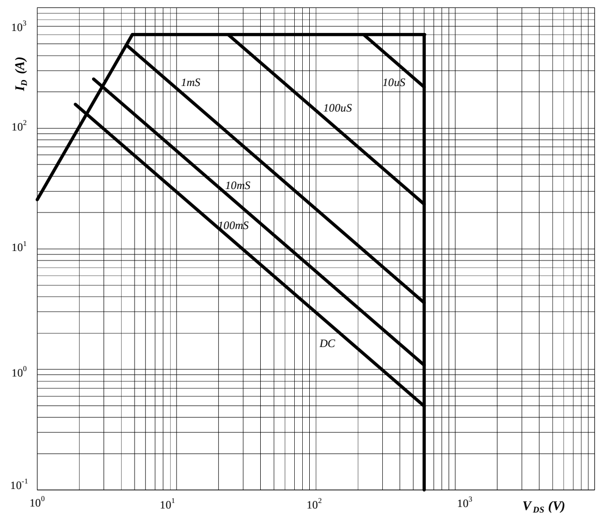
T_j = 175 ºC

INPUT BOOST

figure 25.	IGBT

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



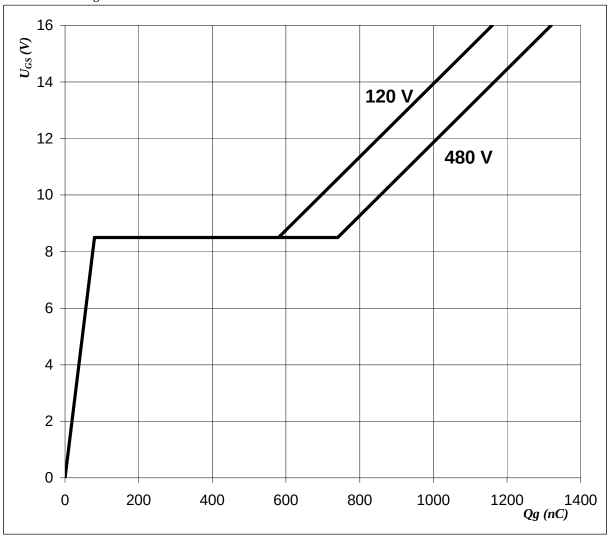
At

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

figure 26.	IGBT

Gate voltage vs Gate charge

$V_{GS} = f(Q_g)$



At

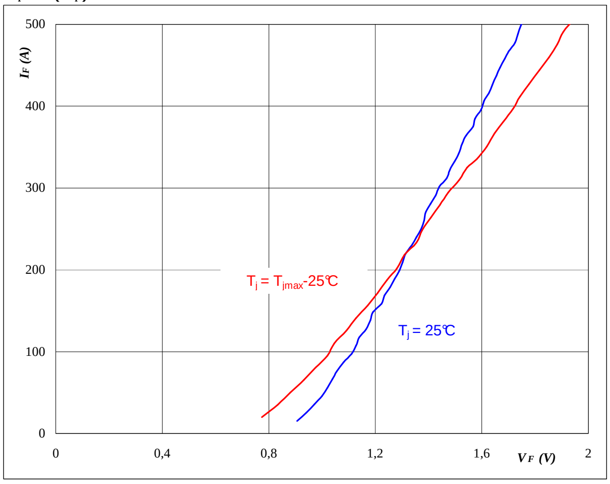
I_D =	200	A

Bypass Diode

figure 1. **Bypass diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



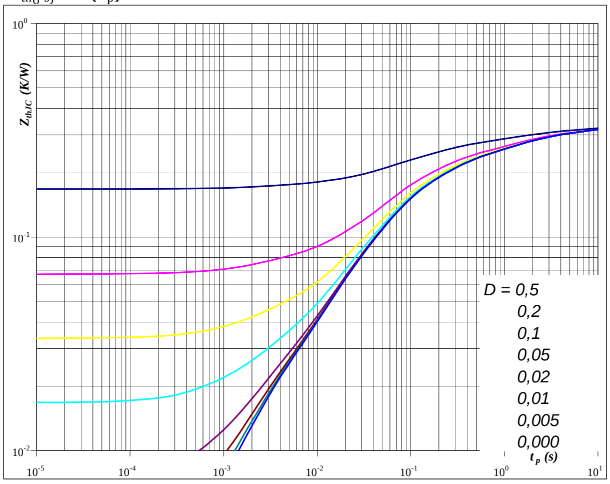
At

t_p = 250 µs

figure 2. **Bypass diode**

Diode transient thermal impedance as a function of pulse width

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



At

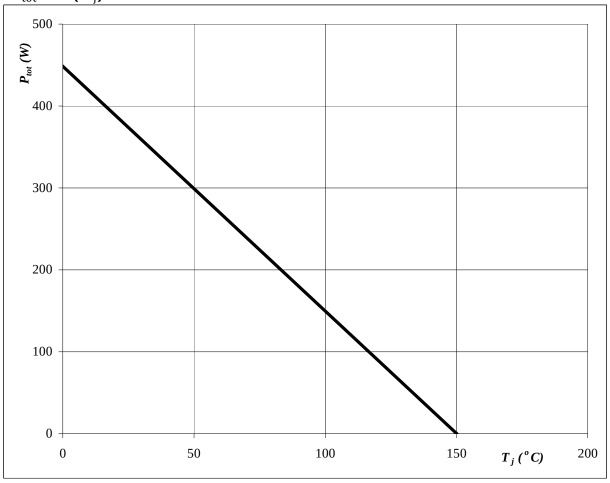
D = t_p / T

$R_{th(j-s)}$ = 0,33 K/W

figure 3. **Bypass diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_j)$



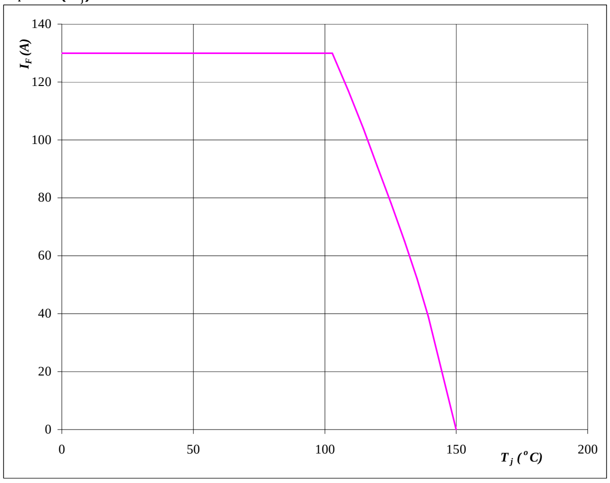
At

T_j = 150 ºC

figure 4. **Bypass diode**

Forward current as a function of heatsink temperature

$I_F = f(T_j)$



At

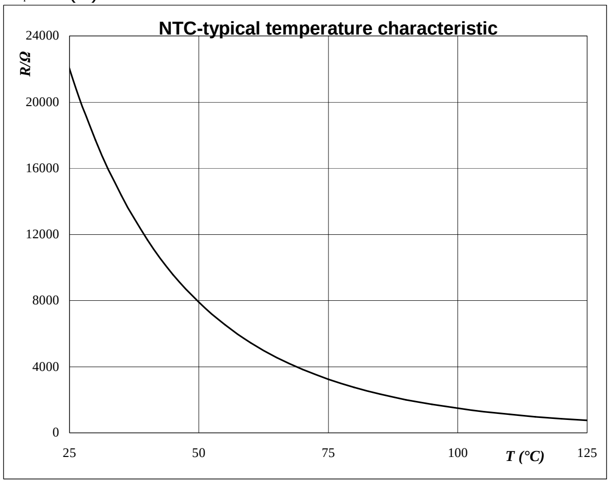
T_j = 150 ºC

Thermistor

figure 1.	Thermistor

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$



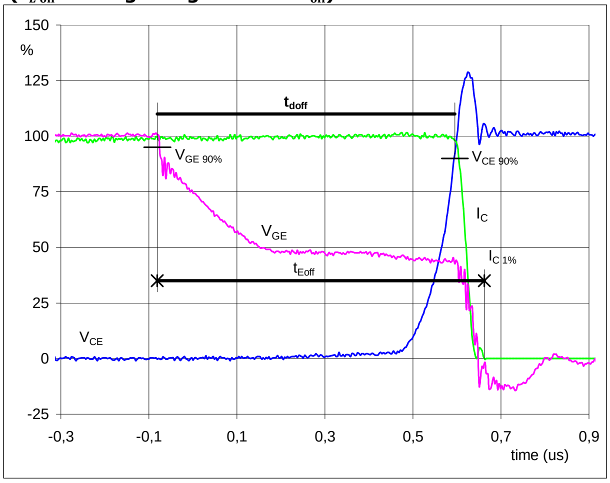
Switching Definitions BOOST IGBT

General conditions

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

figure 1. **IGBT**

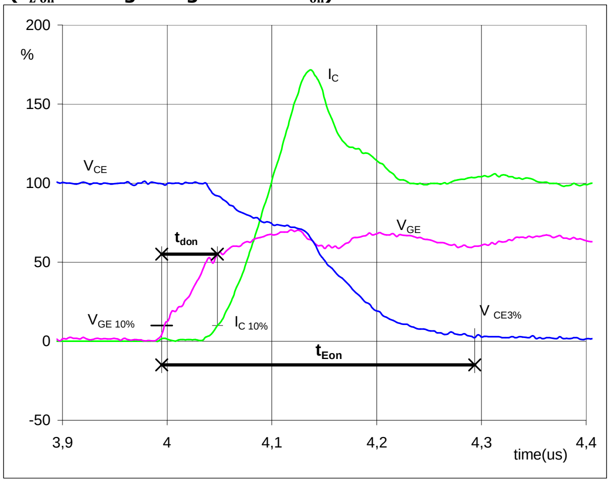
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) = 0 V
V_{GE} (100%) = 15 V
V_C (100%) = 350 V
I_C (100%) = 199 A
t_{doff} = 0,67 µs
$t_{E\,off}$ = 0,74 µs

figure 2. **IGBT**

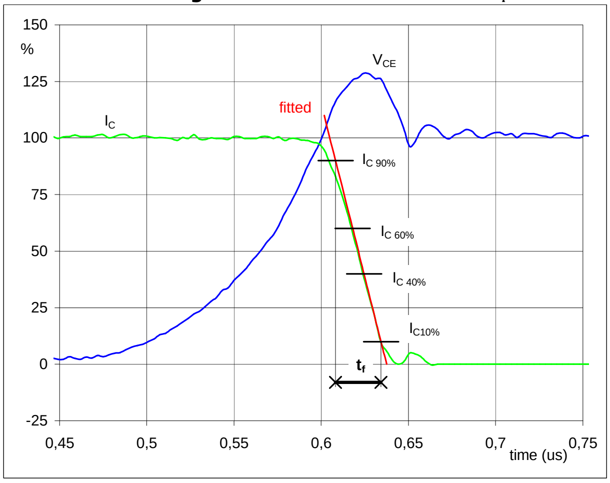
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) = 0 V
V_{GE} (100%) = 15 V
V_C (100%) = 350 V
I_C (100%) = 199 A
t_{don} = 0,05 µs
$t_{E\,on}$ = 0,30 µs

figure 3. **IGBT**

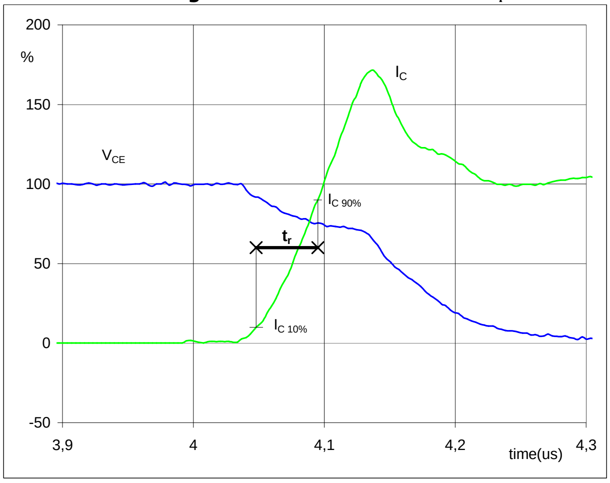
Turn-off Switching Waveforms & definition of t_f



V_C (100%) = 350 V
I_C (100%) = 199 A
t_f = 0,03 µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

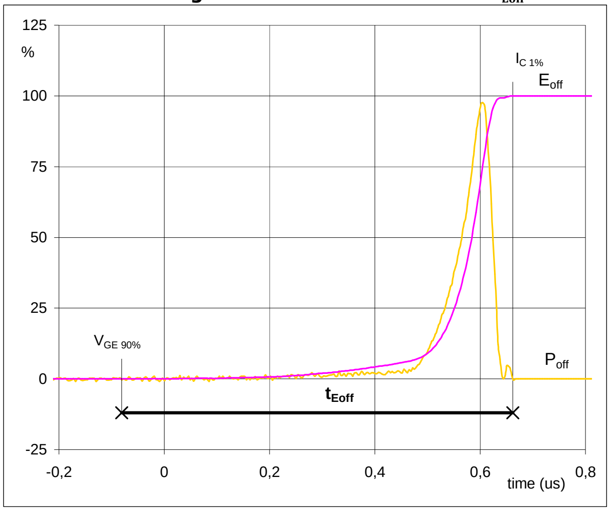


V_C (100%) = 350 V
I_C (100%) = 199 A
t_r = 0,05 µs

Switching Definitions BOOST IGBT

figure 5. **IGBT**

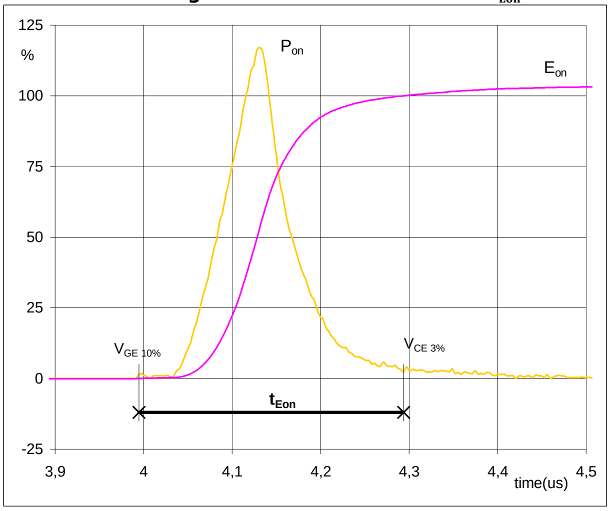
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	69,74	kW
E_{off} (100%) =	5,16	mJ
$t_{E\,off}$ =	0,74	µs

figure 6. **IGBT**

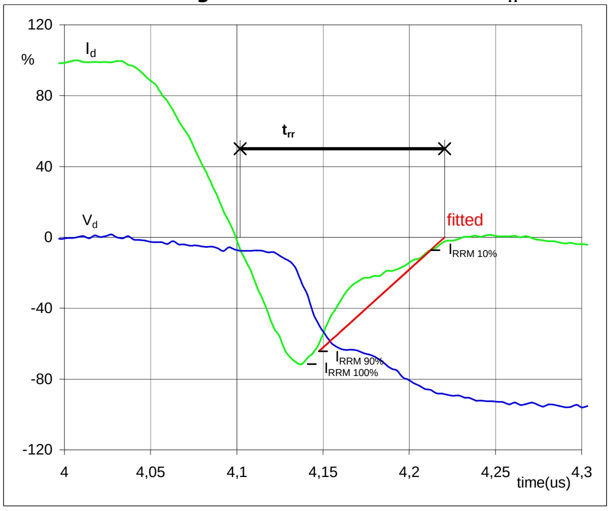
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	69,74	kW
E_{on} (100%) =	7,28	mJ
$t_{E\,on}$ =	0,30	µs

figure 7. **FWD**

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

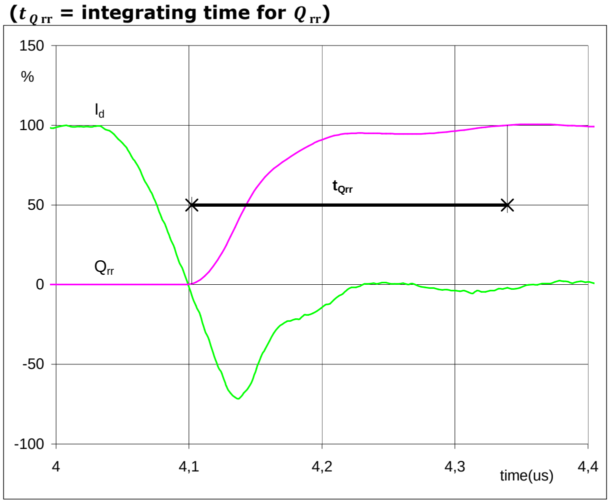


V_d (100%) =	350	V
I_d (100%) =	199	A
I_{RRM} (100%) =	-144	A
t_{rr} =	0,12	µs

Switching Definitions BOOST IGBT

figure 8. **FWD**

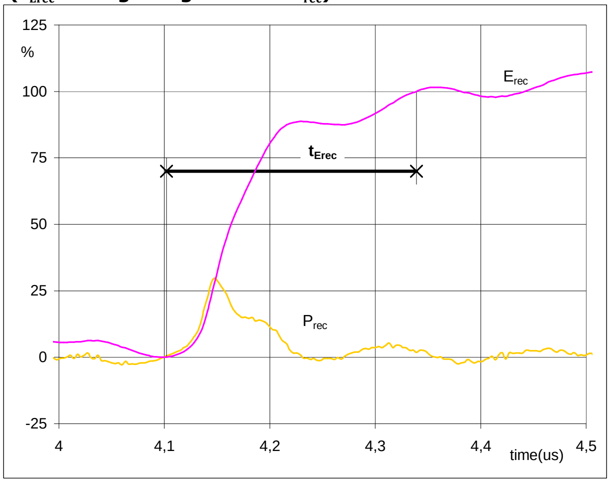
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	199	A
Q_{rr} (100%) =	8,32	μC
$t_{Q\,rr}$ =	0,24	μs

figure 9. **FWD**

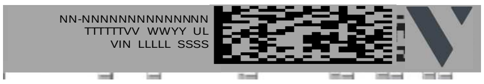
Turn-on Switching Waveforms & definition of t_{Erec}
(t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	69,74	kW
E_{rec} (100%) =	1,25	mJ
$t_{E\,rec}$ =	0,24	μs

Ordering Code & Marking

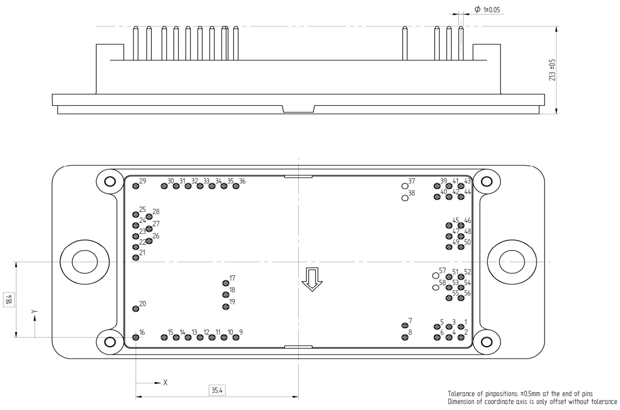
Version	Ordering Code
without thermal paste 17 mm housing	30-F206NBA200SG-M235L25



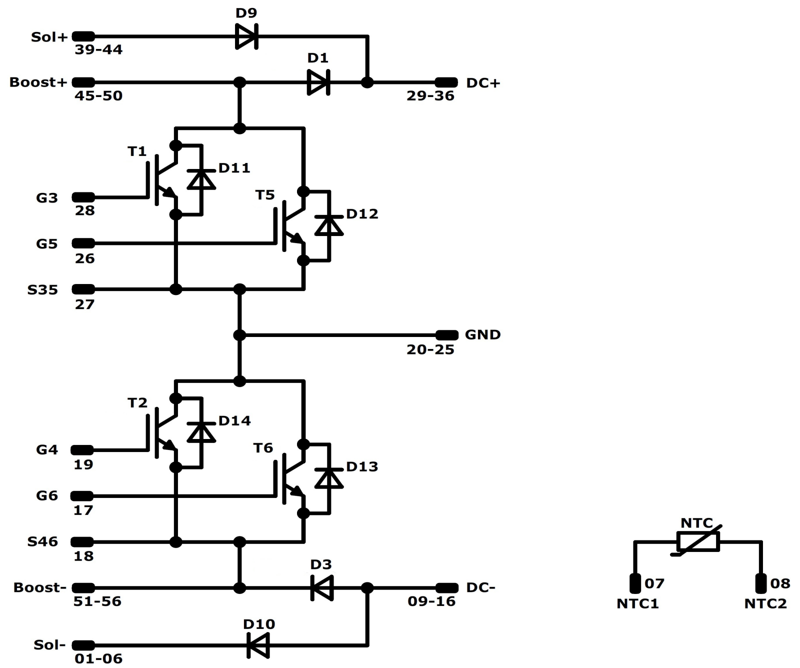
	Name	Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV	WWYY	UL VIN	LLLLL	SSSS
	Type&Ver	Lot number	Serial	Date code	
Datamatrix	TTTTTTVV	LLLLL	SSSS	WWYY	

Outline

Pin table [mm]				Pin table [mm]			
Pin	X	Y	Function	Pin	X	Y	Function
1	70,8	2,6	SOL-	29	0	36,8	DC+
2	70,8	0	SOL-	30	6,2	36,8	DC+
3	68,2	2,6	SOL-	31	8,8	36,8	DC+
4	68,2	0	SOL-	32	11,4	36,8	DC+
5	65,6	2,6	SOL-	33	14	36,8	DC+
6	65,6	0	SOL-	34	16,6	36,8	DC+
7	58,6	2,9	NTC1	35	19,2	36,8	DC+
8	58,6	0	NTC2	36	21,8	36,8	DC+
9	21,8	0	DC-	37, 38	Not assembled		
10	19,2	0	DC-	39	65,6	36,8	SOL+
11	16,6	0	DC-	40	65,6	34,2	SOL+
12	14	0	DC-	41	68,2	36,8	SOL+
13	11,4	0	DC-	42	68,2	34,2	SOL+
14	8,8	0	DC-	43	70,8	36,8	SOL+
15	6,2	0	DC-	44	70,8	34,2	SOL+
16	0	0	DC-	45	68,2	27,2	BOOST+
17	19,6	13,3	G6	46	70,8	27,2	BOOST+
18	19,6	10,4	S46	47	68,2	24,6	BOOST+
19	19,6	7,5	G4	48	70,8	24,6	BOOST+
20	0	7	GND	49	68,2	22	BOOST+
21	0	19,4	GND	50	70,8	22	BOOST+
22	0	22	GND	51	68,2	14,8	BOOST-
23	0	24,6	GND	52	70,8	14,8	BOOST-
24	0	27,2	GND	53	68,2	12,2	BOOST-
25	0	29,8	GND	54	70,8	12,2	BOOST-
26	2,9	23,5	G5	55	68,2	9,6	BOOST-
27	2,9	26,4	S35	56	70,8	9,6	BOOST-
28	2,9	29,3	G3	57, 58	Not assembled		



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
D9 , D10	FWD	1600 V	170 A	Bypass Diode	
T1 , T2 , T5 , T6	IGBT	650 V	100 A	Input Boost IGBT	
D11 , D12 , D13 , D14	FWD	600 V	50 A	Input Boost Inverse Diode	
D1 , D3	FWD	600 V	240 A	Input Boost Diode	
NTC	Thermistor			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	**36**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 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
30-F206NBA200SG-M235L25-D5-14	15 Feb. 2019	flow2 frame modification	1,17

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Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.

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.