flow BOOST 2	600V/200A

Features

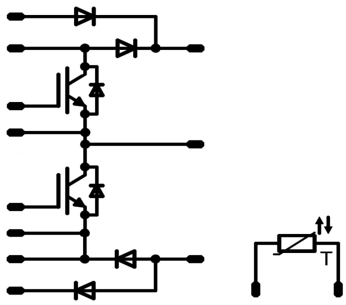
- High efficiency symmetric boost
- Ultra fast switching frequency
- Low Inductance Layout

flow BOOST 2 17mm housing

Target Applications

- solar inverter

Schematic



Types

- 30-F206NBA200SA-M235L33

Maximum Ratings

Tj=25℃, 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_h=80℃ T_c=80℃	183 245	A
Surge (non-repetitive) forward current	I_{FSM}	t_p=10ms, sin 180°	T_j=150℃	1650	A
I2t-value	I^2t			13600	A^2s
Power dissipation *	P_{tot}	T_j=$T_j$max	T_h=80℃ T_c=80℃	235 356	W
Maximum Junction Temperature	$T_j$max			150	℃

* measured with phase-change material

Parameter	Symbol	Condition		Value	Unit
Input Boost IGBT					
Collector-emitter breakdown voltage	V_{CE}			600	V
DC collector current *	I_C	T_j=$T_j$max	T_h=80℃ T_c=80℃	184 241	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by $T_j$max		600	A
Power dissipation *	P_{tot}	T_j=$T_j$max	T_h=80℃ T_c=80℃	340 514	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150℃ V_{GE}=15V		6 360	µs V
Maximum Junction Temperature	$T_j$max			175	℃

* measured with phase-change material

Maximum Ratings

Tj=25℃, 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	$T_j=T_j$max	T_h=80℃ T_c=80℃	99 130	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		200	A
Power dissipation *	P_{tot}	$T_j=T_j$max	T_h=80℃ T_c=80℃	169 257	W
Maximum Junction Temperature	$T_j$max			175	℃
* measured with phase-change material					
Input Boost Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current *	I_F	$T_j=T_j$max	T_h=80℃ T_c=80℃	147 187	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		400	A
Power dissipation *	P_{tot}	$T_j=T_j$max	T_h=80℃ T_c=80℃	231 350	W
Maximum Junction Temperature	$T_j$max			175	℃
* measured with phase-change material					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	℃
Operation temperature under switching condition	T_{op}			-40…+(Tjmax - 25)	℃
Isolation Properties					
Isolation 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	
Bypass Diode										
Forward voltage	V_F				135	Tj=25℃ Tj=125℃		1,19 1,15	1,4	V
Threshold voltage (for power loss calc. only)	V_{to}				135	Tj=25℃ Tj=125℃		0,90 0,78		V
Slope resistance (for power loss calc. only)	r_t				135	Tj=25℃ Tj=125℃		0,002 0,003		Ω
Reverse current	I_r			1600		Tj=25℃ Tj=125℃			0,1	mA
Thermal resistance junction to sink	R_{thJH}	phase-change material						0,30		K/W
Thermal resistance junction to sink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,35		K/W
Input Boost IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$				0,0032	Tj=25℃ Tj=125℃	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		200	Tj=25℃ Tj=125℃	1,05	1,65 1,87	1,85	V
Collector-emitter cut-off	I_{CES}		0	600		Tj=25℃ Tj=125℃			0,010	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25℃ Tj=125℃			2400	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=2 Ω Rgon=2 Ω	15	350	200	Tj=25℃ Tj=125℃		49 49		ns
Rise time	t_r					Tj=25℃ Tj=125℃		35 37		
Turn-off delay time	$t_{d(off)}$					Tj=25℃ Tj=125℃		422 451		
Fall time	t_f					Tj=25℃ Tj=125℃		28 37		
Turn-on energy loss	E_{on}					Tj=25℃ Tj=125℃		3,48 4,37		mWs
Turn-off energy loss	E_{off}					Tj=25℃ Tj=125℃		5,79 7,37		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25℃		12560		pF
Output capacitance	C_{oes}							800		
Reverse transfer capacitance	C_{res}							372		
Gate charge	Q_{Gate}		15	480	200	Tj=25℃		1240		nC
Thermal resistance junction to sink	R_{thJH}	phase-change material						0,28		K/W
Thermal resistance junction to sink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,33		K/W
Input Boost Inverse Diode										
Diode forward voltage	V_F				100	Tj=25℃ Tj=125℃	1,2	1,78 1,74	1,9	V
Thermal resistance junction to sink	R_{thJH}	phase-change material						0,56		K/W
Thermal resistance junction to sink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,66		K/W

Characteristic Values

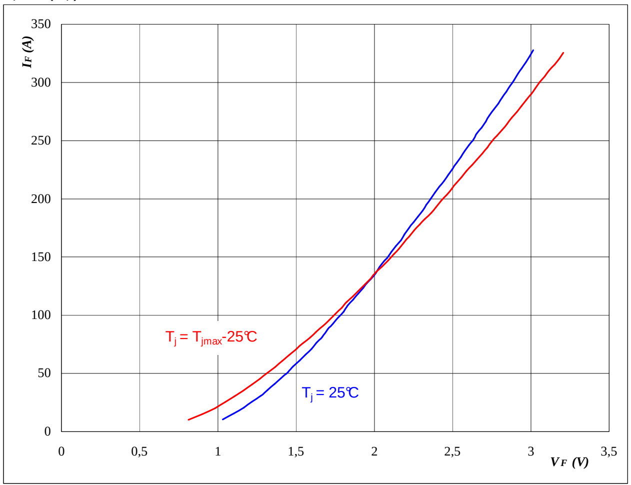
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Input Boost Diode										
Forward voltage	V_F				200	Tj=25℃ Tj=125℃	1	1,88 1,83	2	V
Reverse leakage current	I_{rm}		15	350	200	Tj=25℃ Tj=125℃			108	µA
Peak recovery current	I_{RRM}					Tj=25℃ Tj=125℃		118 179		A
Reverse recovery time	t_{rr}					Tj=25℃ Tj=125℃		120 148		ns
Reverse recovery charge	Q_{rr}	Rgon=2 Ω	15	350	200	Tj=25℃ Tj=125℃		8,06 15,59		µC
Reverse recovered energy	E_{rec}					Tj=25℃ Tj=125℃		2,03 4,00		mWs
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25℃ Tj=125℃		1029 1886		A/µs
Thermal resistance junction to sink	R_{thJH}	phase-change material						0,41		K/W
Thermal resistance junction to case	R_{thJC}	Thermal grease thickness≤50um λ = 1 W/mK						0,48		K/W
Thermistor										
Rated resistance	R					Tj=25℃		22000		Ω
Deviation of R100	ΔR/R	R100=1486 Ω				Tc=100℃	-5		+5	%
Power dissipation	P					Tj=25℃		200		mW
Power dissipation constant						Tj=25℃		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				Tj=25℃		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				Tj=25℃		3996		K
Vincotech NTC Reference						Tj=25℃			B	

Input BOOST Inverse Diode

Figure 25 Boost Inverse Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



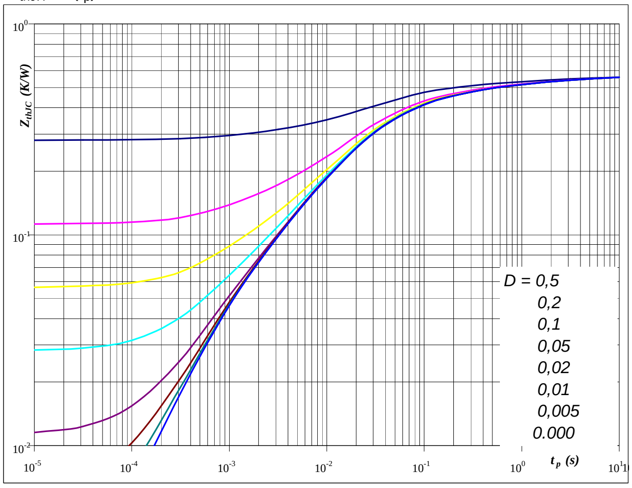
At

t_p =	350	μs

Figure 26 Boost Inverse Diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



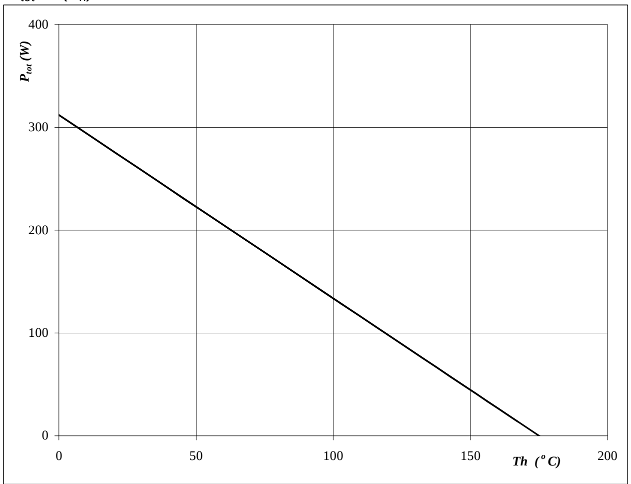
At

D =	tp / T	
R_{thJH} =	0,56	K/W

Figure 27 Boost Inverse Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



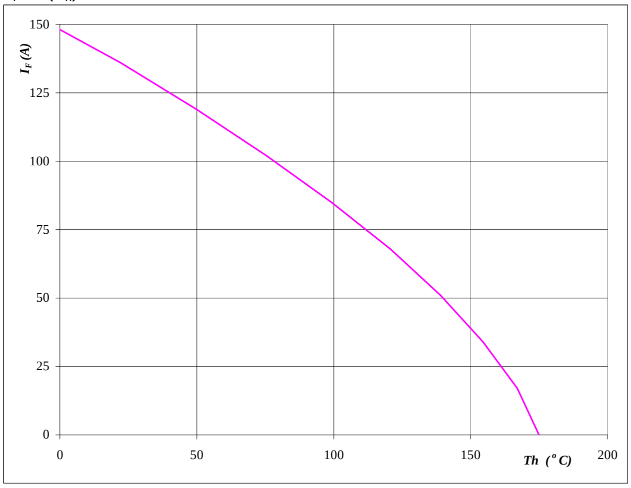
At

T_j =	175	ºC

Figure 28 Boost Inverse Diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

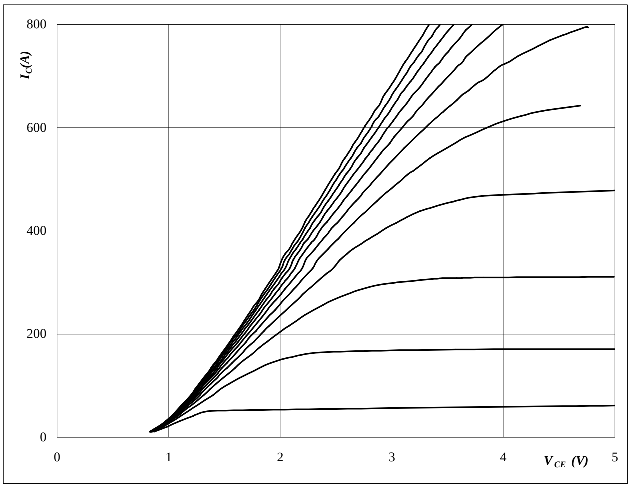
T_j =	175	ºC

INPUT BOOST

Figure 1 BOOST IGBT

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 350 µs

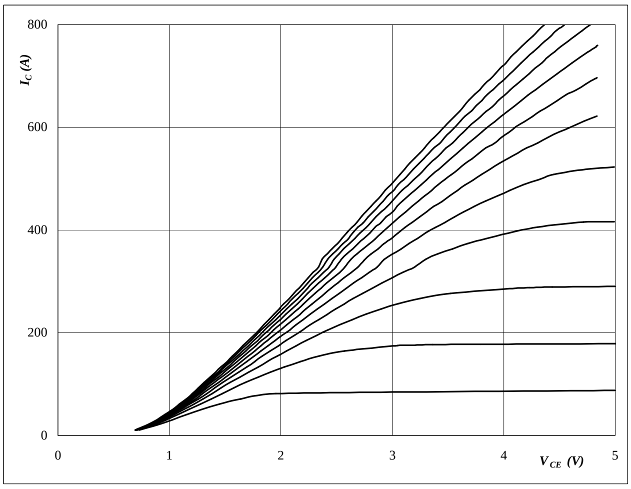
T_j = 25 °C

V_{GS} from 8 V to 18 V in steps of 1 V

Figure 2 BOOST IGBT

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 350 µs

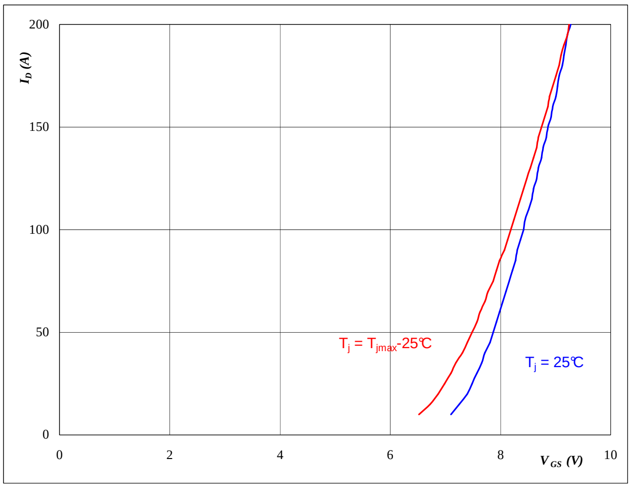
T_j = 125 °C

V_{GS} from 8 V to 18 V in steps of 1 V

Figure 3 BOOST IGBT

Typical transfer characteristics

$I_D = f(V_{GS})$



At

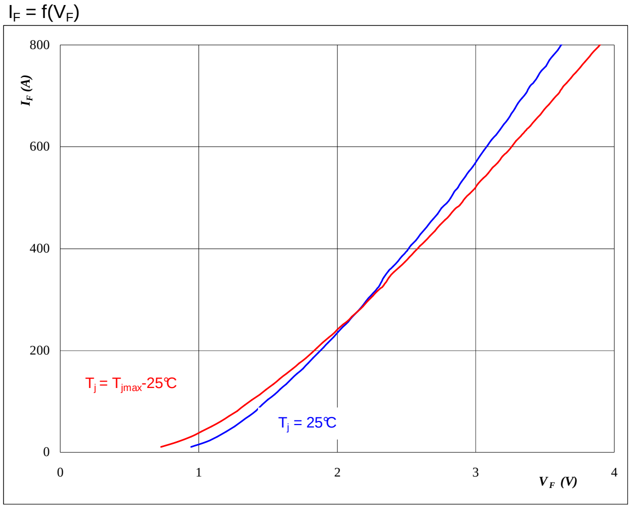
t_p = 350 µs

V_{DS} = 10 V

Figure 4 BOOST FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

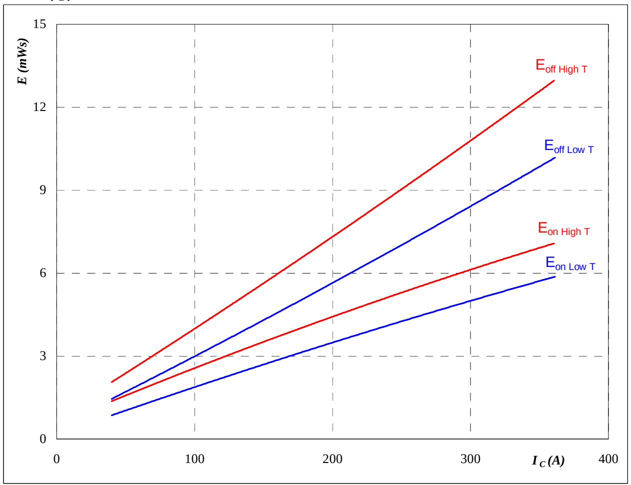
t_p = 350 µs

INPUT BOOST

Figure 5 BOOST IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_D)$



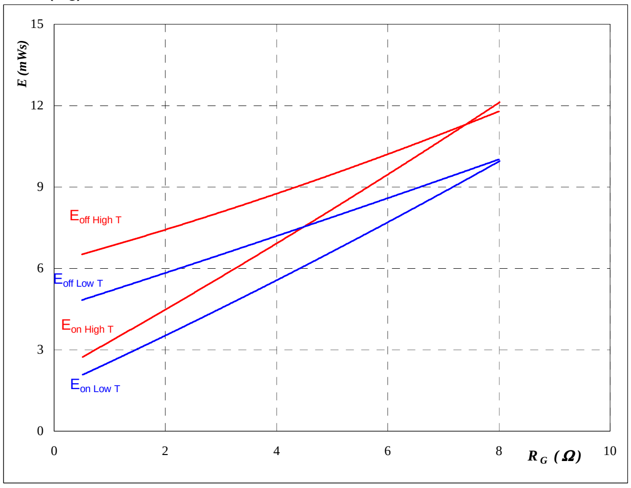
With an inductive load at

T_j =	25/125	°C
V_{DS} =	350	V
V_{GS} =	15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 6 BOOST IGBT

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



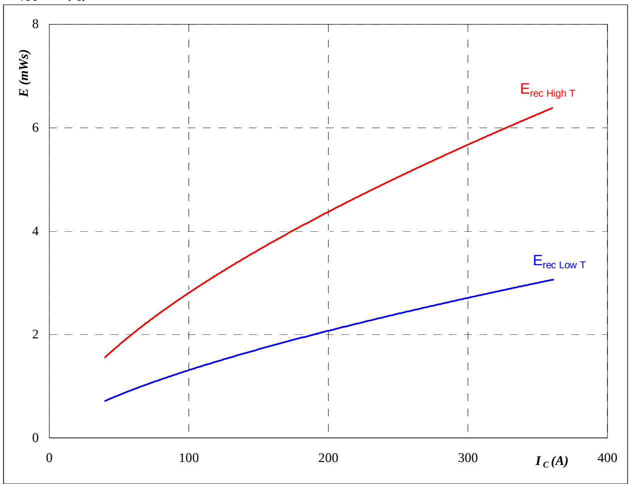
With an inductive load at

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

Figure 7 BOOST FWD

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

$E_{rec} = f(I_c)$



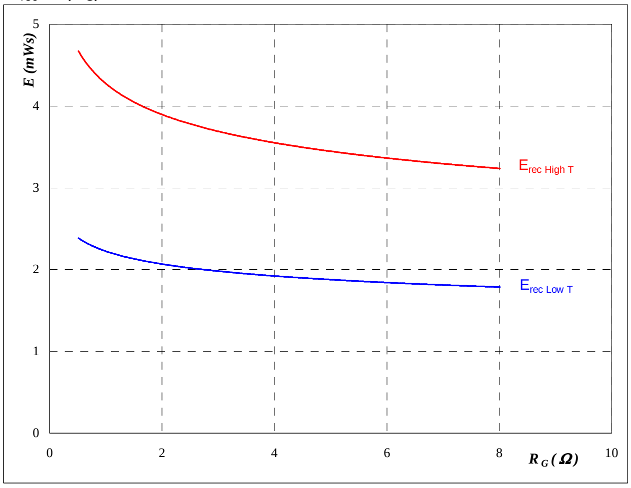
With an inductive load at

T_j =	25/125	°C
V_{DS} =	350	V
V_{GS} =	15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 8 BOOST FWD

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

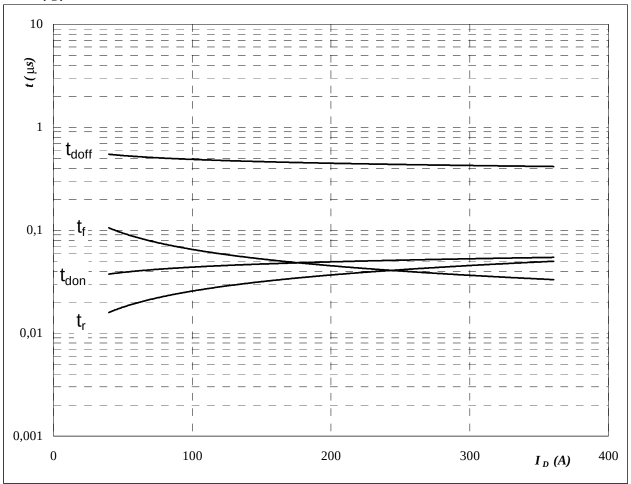
T_j =	25/125	°C
V_{DS} =	350	V
V_{GS} =	15	V
I_D =	200	A

INPUT BOOST

Figure 9	BOOST IGBT

Typical switching times as a function of collector current

t = f(I_D)



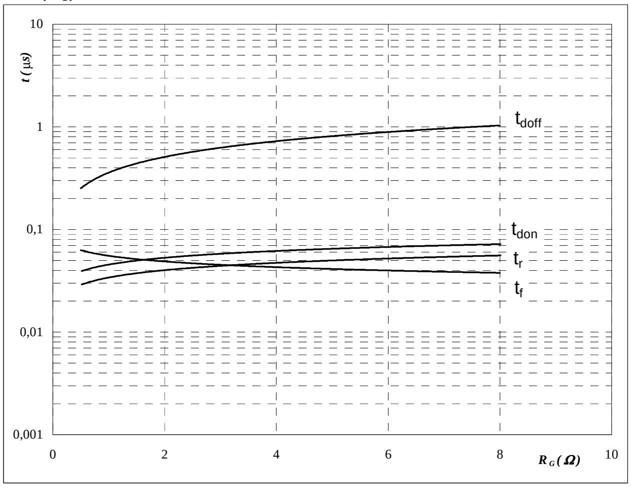
With an inductive load at

T_j =	125	°C
V_{DS} =	350	V
V_{GS} =	15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 10	BOOST IGBT

Typical switching times as a function of gate resistor

t = f(R_G)



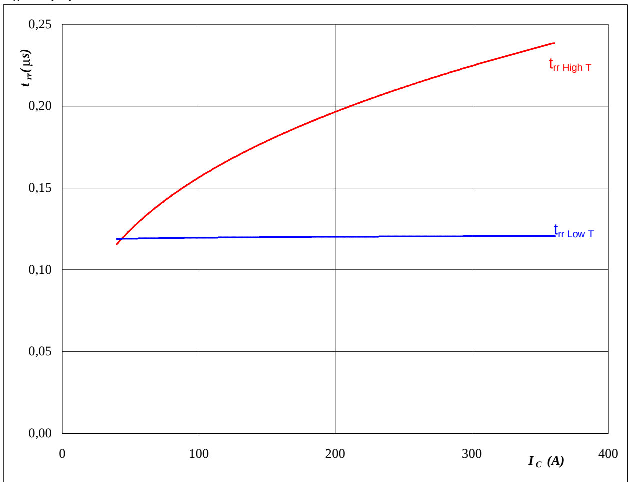
With an inductive load at

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

Figure 11	BOOST FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



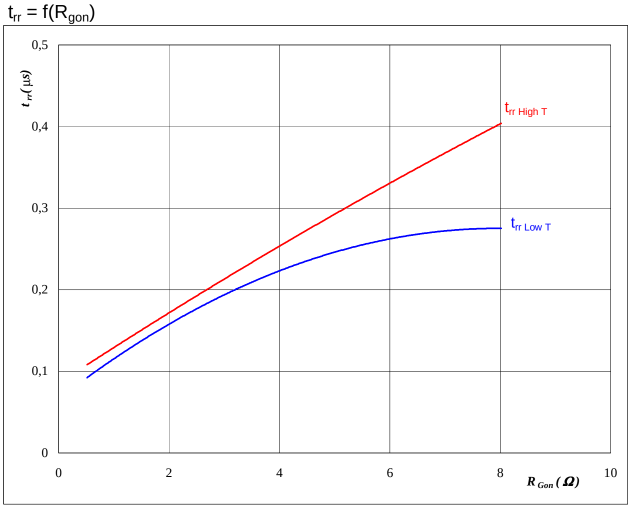
At

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	2	Ω

Figure 12	BOOST FWD

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

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



At

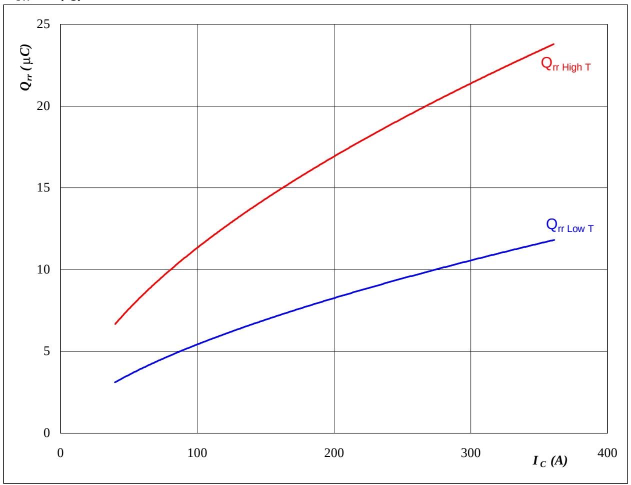
T_j =	25/125	°C
V_R =	350	V
I_F =	200	A
V_{GS} =	15	V

INPUT BOOST

Figure 13 BOOST FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



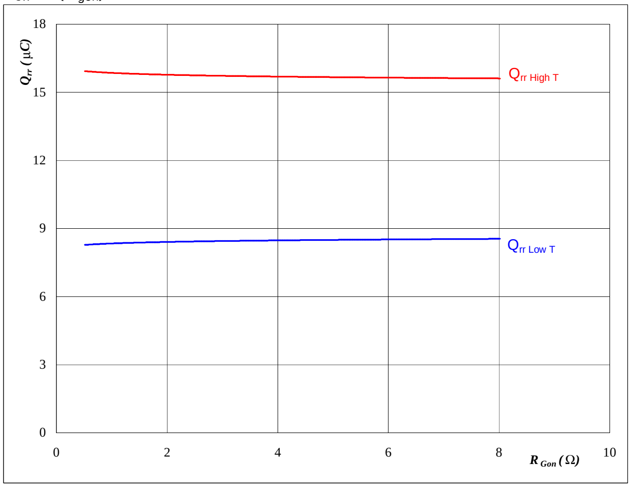
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	2	Ω

Figure 14 BOOST FWD

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

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



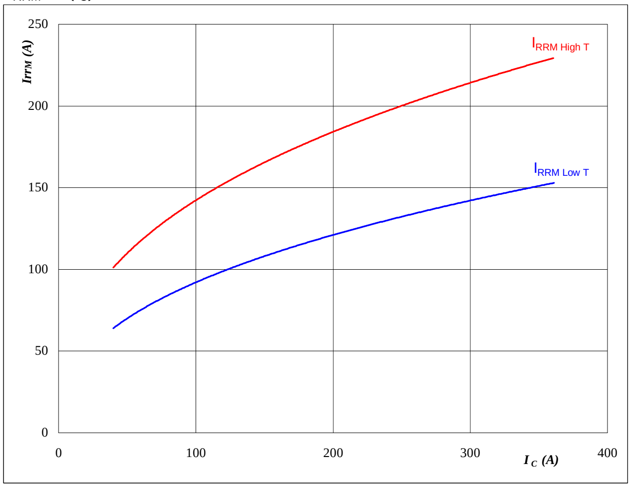
At

Tj =	25/125	℃
VR =	350	V
IF =	200	A
VGS =	15	V

Figure 15 BOOST FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



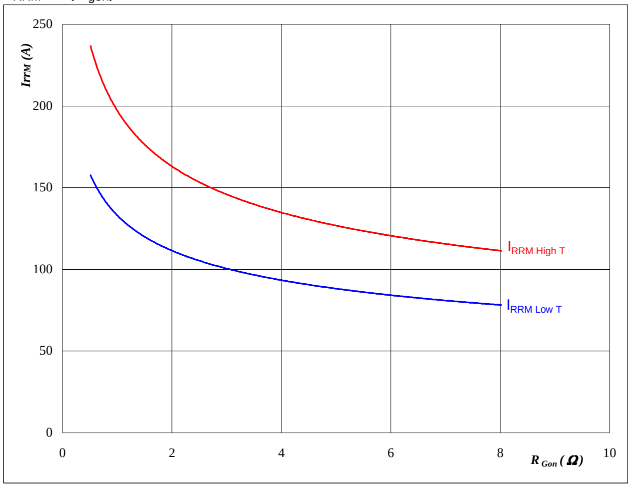
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	2	Ω

Figure 16 BOOST FWD

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

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



At

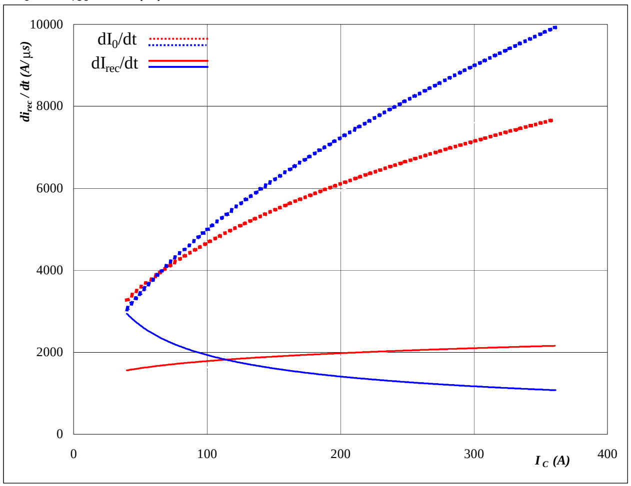
T_j =	25/125	℃
V_R =	350	V
I_F =	200	A
V_{GS} =	15	V

INPUT BOOST

Figure 17 BOOST FWD

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

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



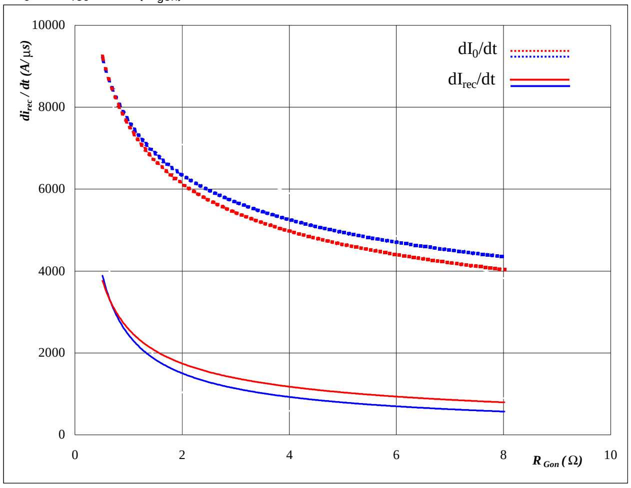
At

T_j =	25/125	℃
V_{CE} =	350	V
V_{GE} =	15	V
R_{gon} =	2	Ω

Figure 18 BOOST FWD

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

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



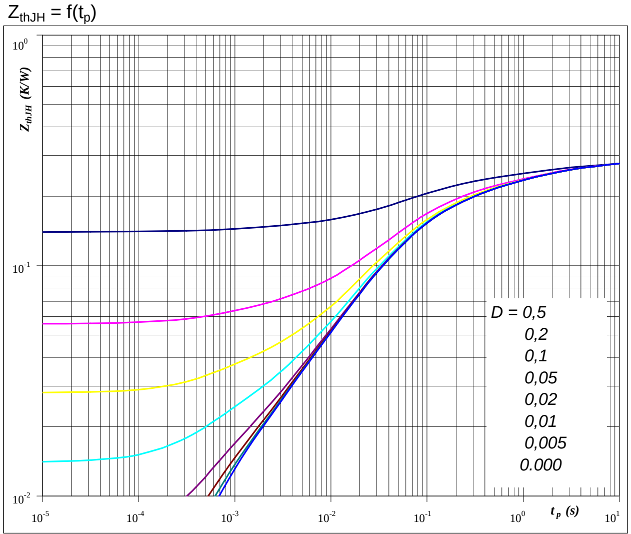
At

Tj =	25/125	℃
VR =	350	V
IF =	200	A
VGS =	15	V

Figure 19 BOOST IGBT

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

$Z_{thJH} = f(t_p)$



At

D =	t_p / T				
R_{thJH} =	0,28	K/W	RthJH =	0,33	K/W

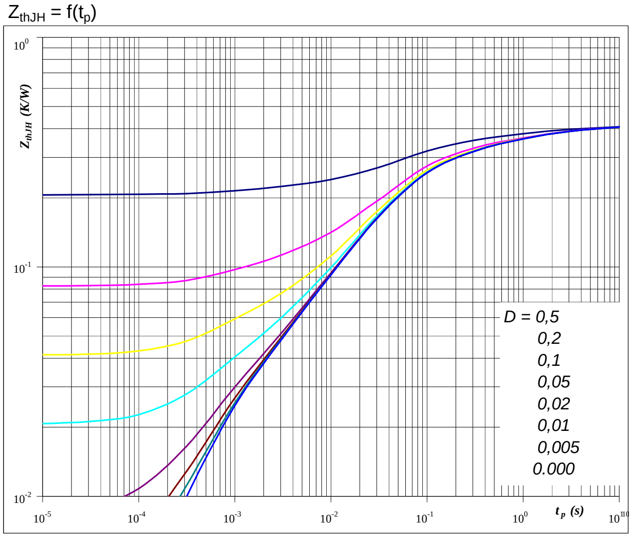
IGBT thermal model values

Phase change interface R (C/W)	Tau (s)	Thermal grease R (C/W)	Tau (s)
0,04	3,79E+00	0,05	3,79E+00
0,05	8,27E-01	0,06	8,27E-01
0,08	1,57E-01	0,09	1,57E-01
0,09	3,54E-02	0,10	3,54E-02
0,02	6,25E-03	0,02	6,25E-03
0,01	7,79E-04	0,01	7,79E-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} =	0,41	K/W	RthJH =	0,48	K/W

FWD thermal model values

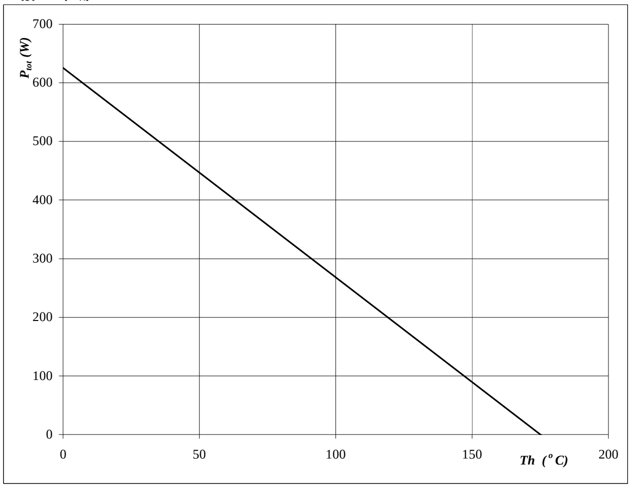
Phase change interface R (C/W)	Tau (s)	Thermal grease R (C/W)	Tau (s)
0,03	5,14E+00	0,04	5,14E+00
0,06	1,01E+00	0,07	1,01E+00
0,09	1,84E-01	0,10	1,84E-01
0,16	4,26E-02	0,19	4,26E-02
0,04	8,06E-03	0,05	8,06E-03
0,02	8,50E-04	0,03	8,50E-04

INPUT BOOST

Figure 21	BOOST IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



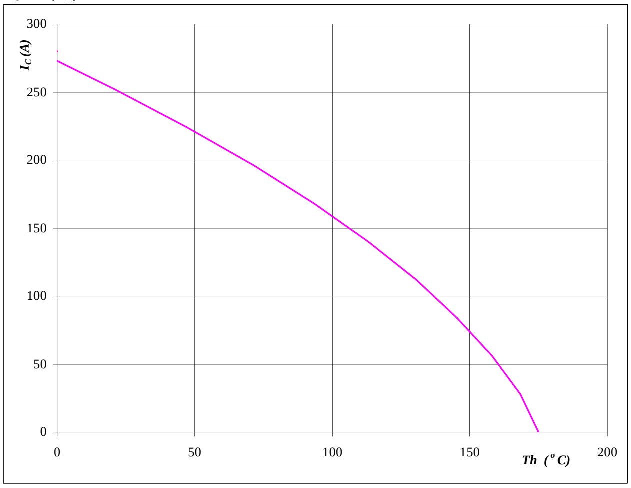
At

T_j = 175 ºC

Figure 22	BOOST IGBT

Collector/Drain current as a function of heatsink temperature

$I_C = f(T_h)$



At

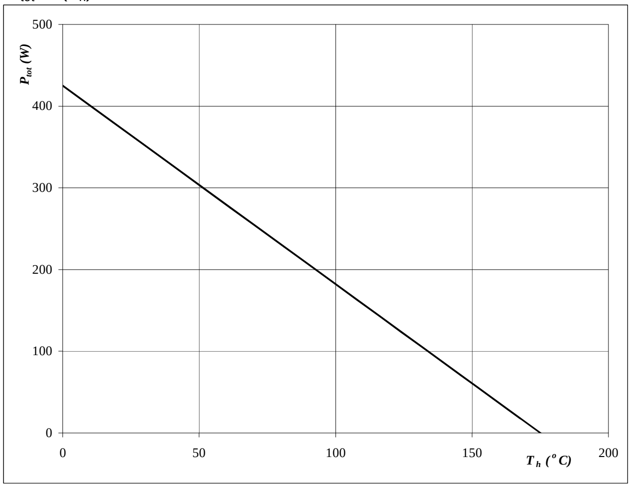
T_j = 175 ºC

V_{GS} = 15 V

Figure 23	BOOST FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



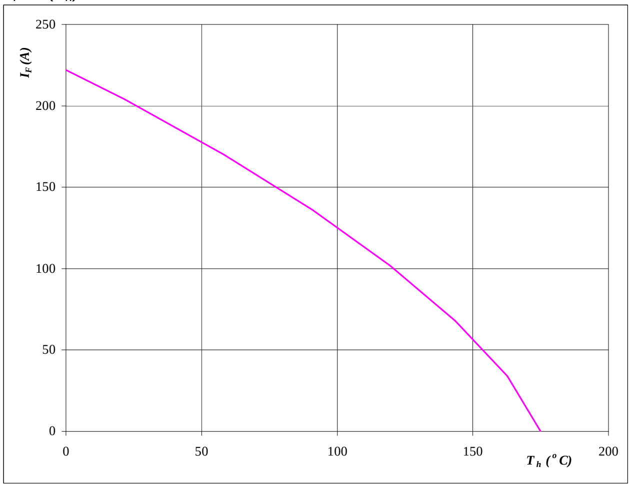
At

T_j = 175 ºC

Figure 24	BOOST FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

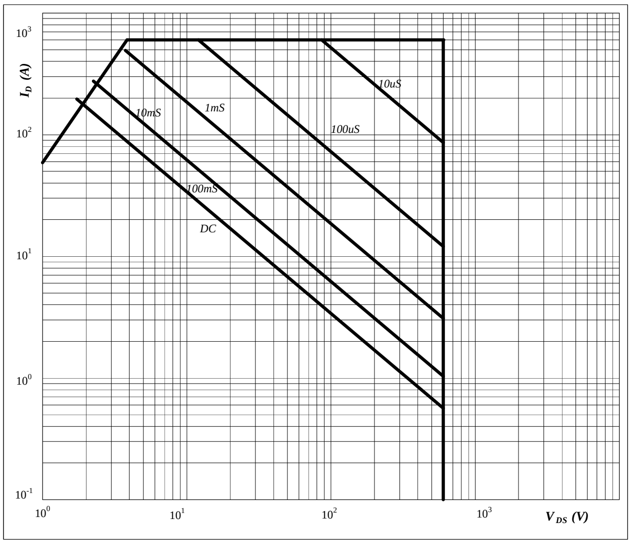
T_j = 175 ºC

INPUT BOOST

Figure 25 BOOST IGBT

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



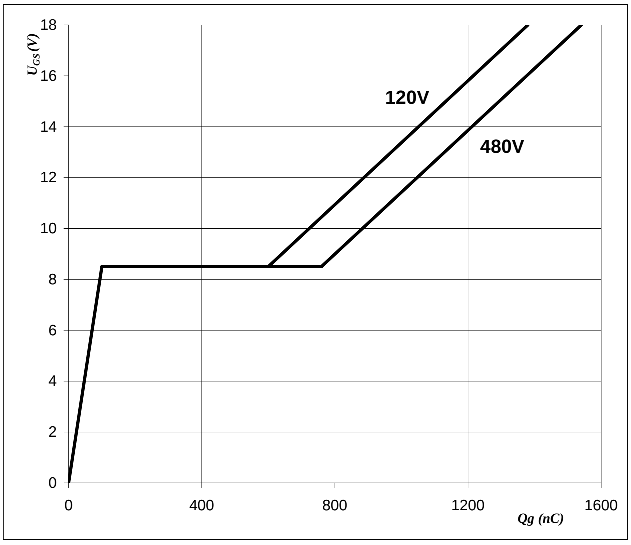
At

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

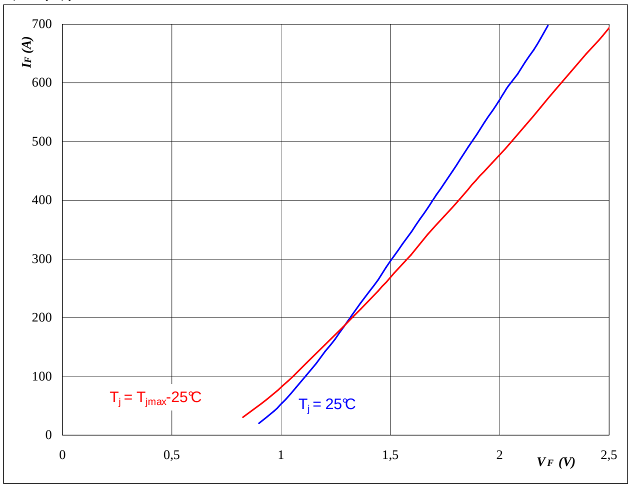
I_D =	200	A

Bypass Diode

Figure 1 Bypass diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



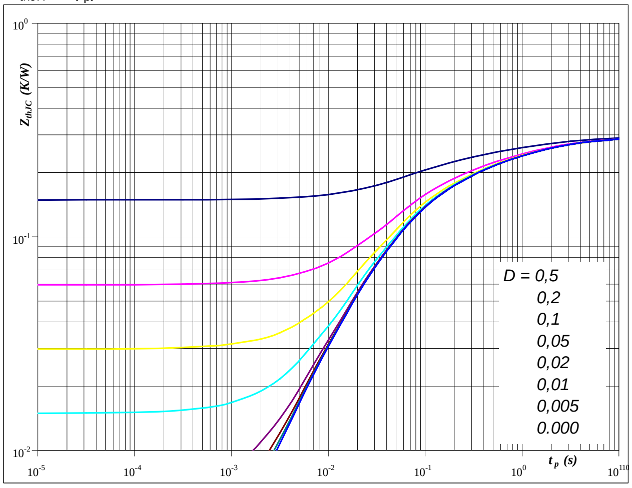
At

t_p = 350 µs

Figure 2 Bypass diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

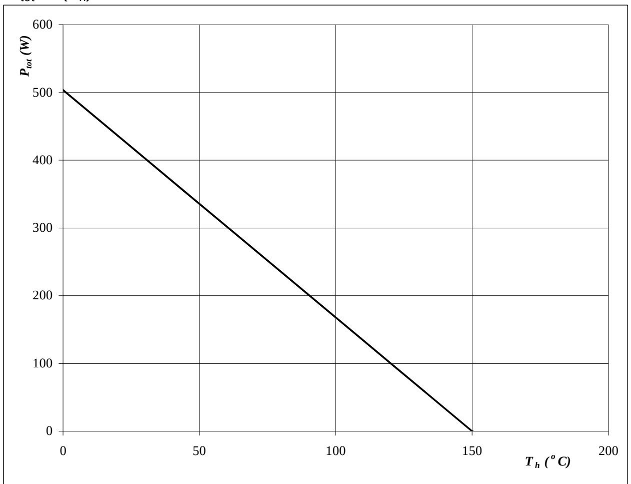
D = t_p / T

R_{thJH} = 0,30 K/W

Figure 3 Bypass diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



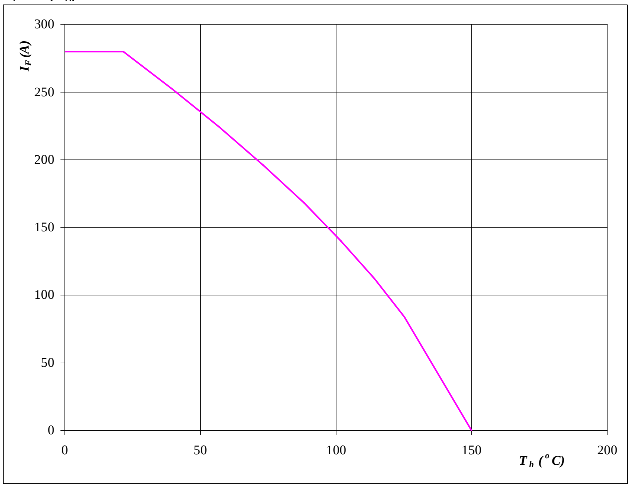
At

T_j = 150 ºC

Figure 4 Bypass diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

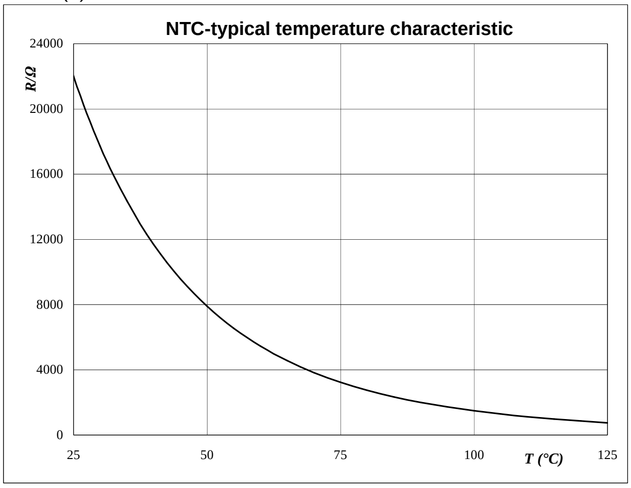
T_j = 150 ºC

Thermistor

Figure 1 Thermistor

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$



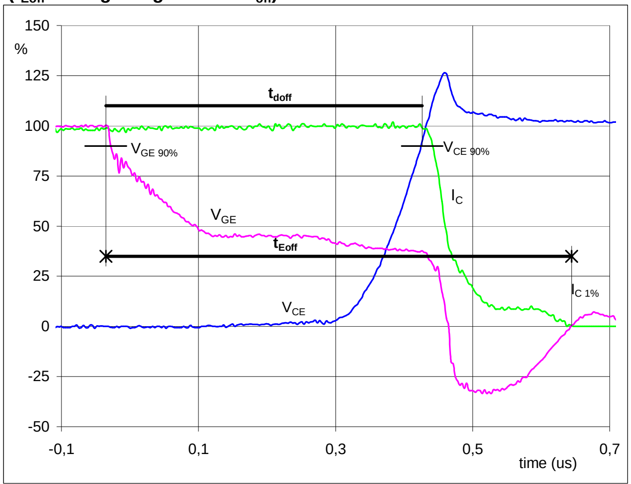
Switching Definitions BOOST IGBT

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

Figure 1 Input Boost IGBT

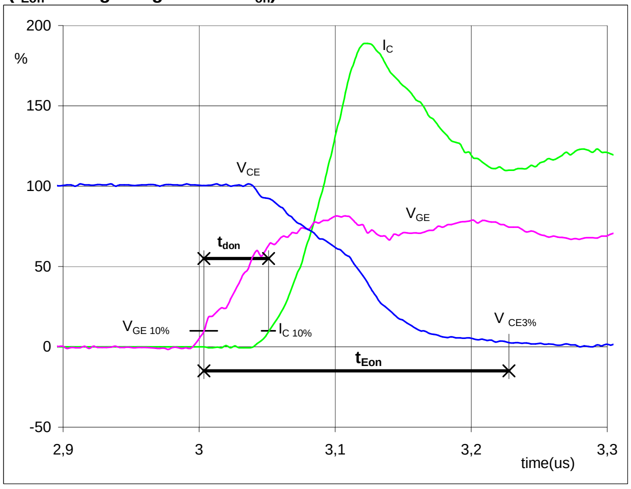
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	199	A
t_{doff} =	0,45	μs
t_{Eoff} =	0,68	μs

Figure 2 Input Boost IGBT

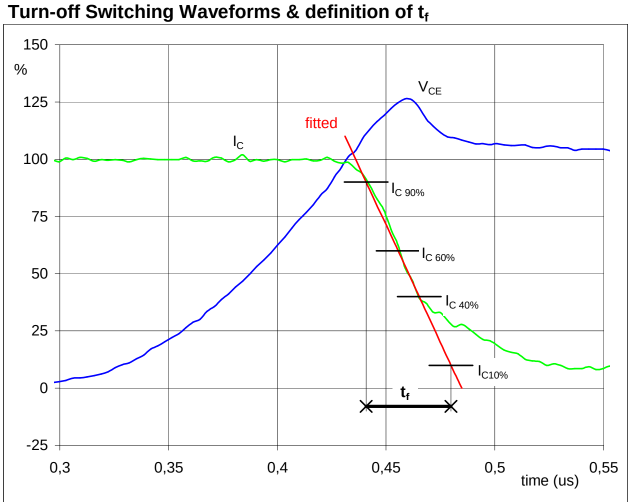
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



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_{Eon} =	0,22	μs

Figure 3 Input Boost IGBT

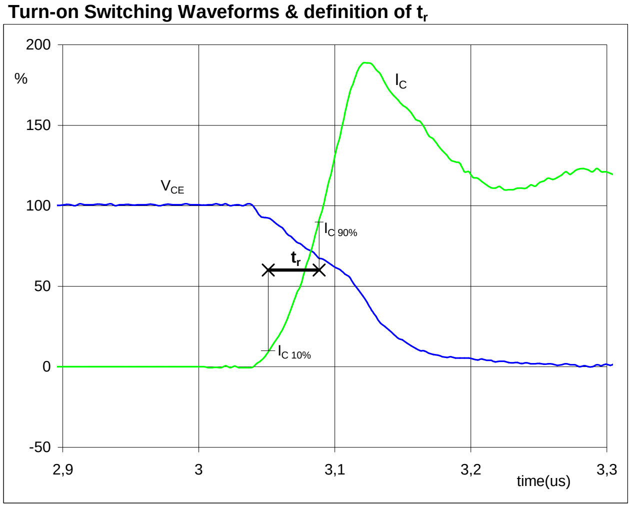
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	350	V
I_C (100%) =	199	A
t_f =	0,04	μs

Figure 4 Input Boost IGBT

Turn-on Switching Waveforms & definition of t_r

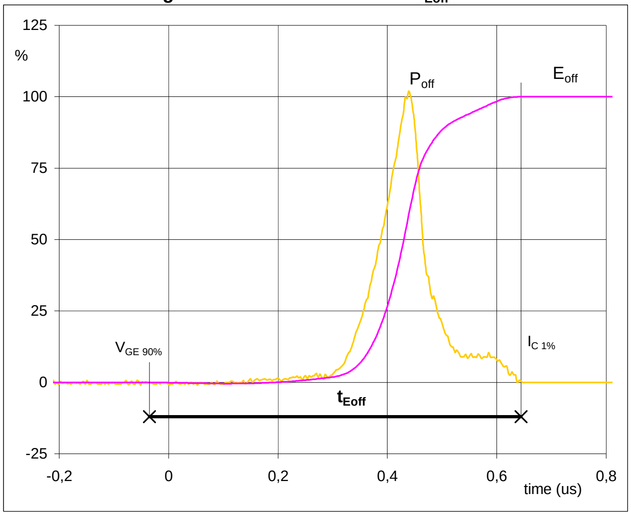


V_C (100%) =	350	V
I_C (100%) =	199	A
t_r =	0,04	μs

Switching Definitions BOOST IGBT

Figure 5 Input Boost IGBT

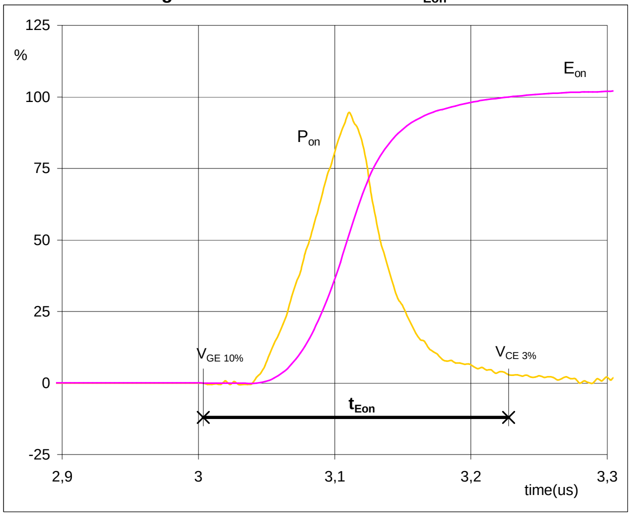
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	69,76	kW
E_{off} (100%) =	7,37	mJ
t_{Eoff} =	0,68	μs

Figure 6 Input Boost IGBT

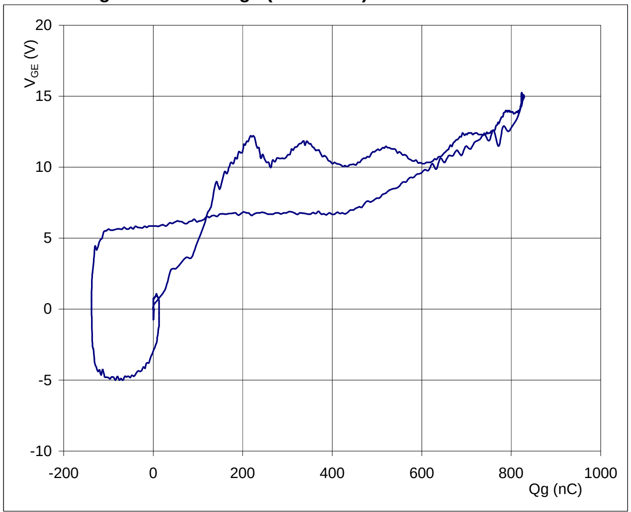
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	69,76	kW
E_{on} (100%) =	4,37	mJ
t_{Eon} =	0,22	μs

Figure 7 Input Boost IGBT

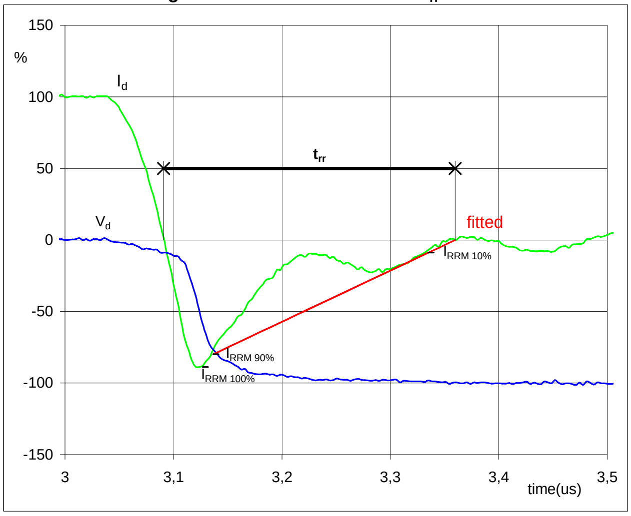
Gate voltage vs Gate charge (measured)



V_{GEoff} =	0	V
V_{GEon} =	15	V
V_C (100%) =	350	V
I_C (100%) =	199	A
Q_g =	827,78	nC

Figure 8 Input Boost FWD

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

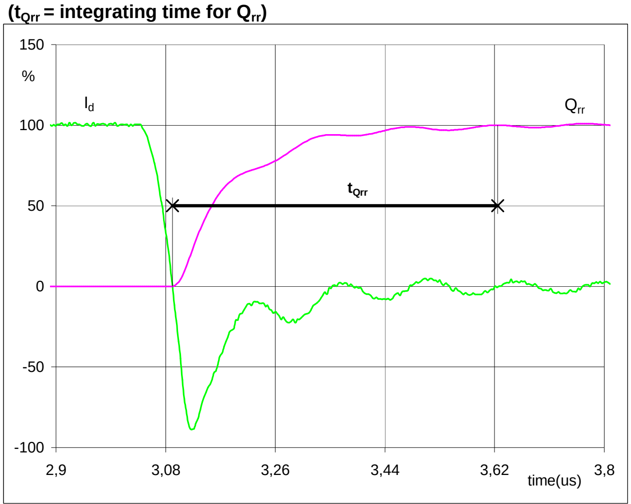


V_d (100%) =	350	V
I_d (100%) =	199	A
I_{RRM} (100%) =	-179	A
t_{rr} =	0,15	μs

Switching Definitions BOOST IGBT

Figure 9 Input Boost FWD

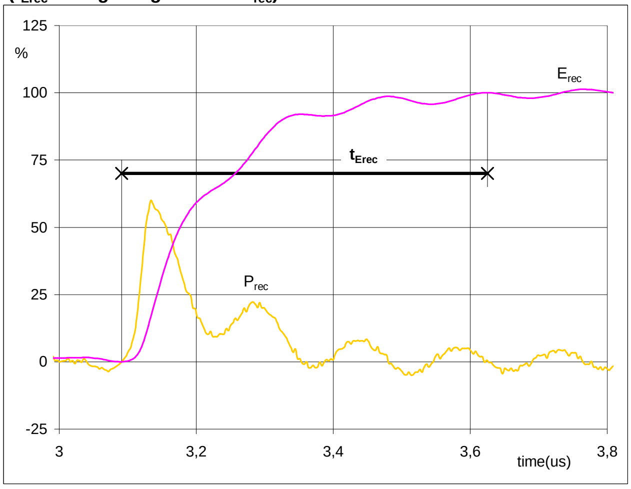
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	199	A
Q_{rr} (100%) =	15,59	µC
t_{Qrr} =	0,53	µs

Figure 10 Input Boost FWD

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



P_{rec} (100%) =	69,76	kW
E_{rec} (100%) =	4,00	mJ
t_{Erec} =	0,53	µs

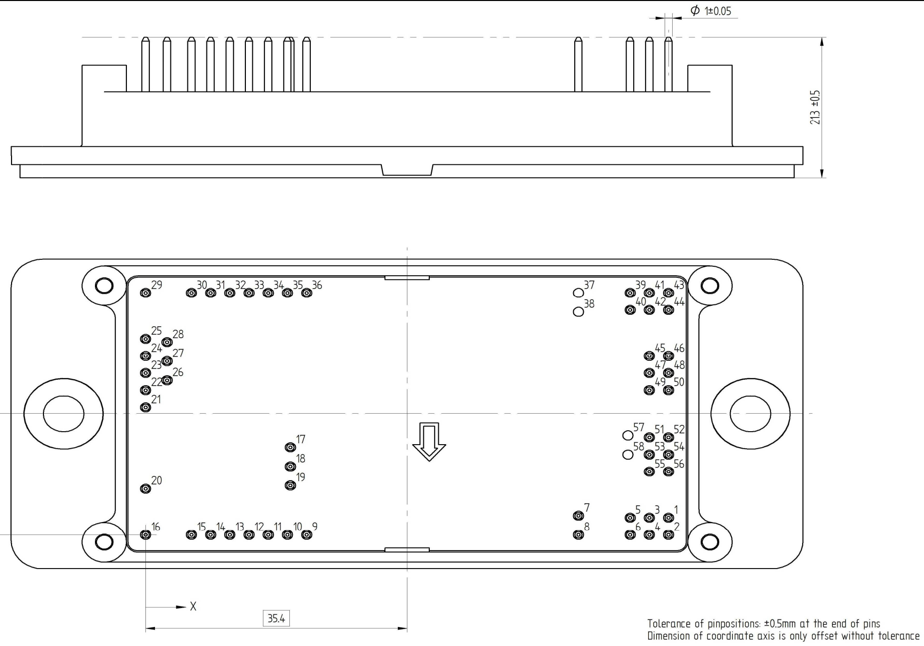
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

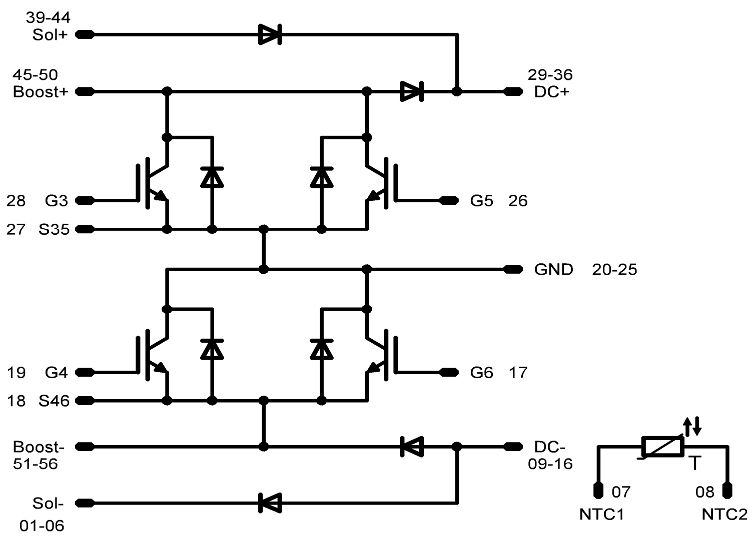
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 17mm housing	30-F206NBA200SA-M235L33	M235L33	M235L33

Outline

Pin	X	Y	Pin	X	Y
1	70,8	2,6			
2	70,8	0			
3	68,2	2,6	29	0	36,8
4	68,2	0	30	6,2	36,8
5	65,6	2,6	31	8,8	36,8
6	65,6	0	32	11,4	36,8
7	58,6	2,9	33	14	36,8
8	58,6	0	34	16,6	36,8
9	21,8	0	35	19,2	36,8
10	19,2	0	36	21,8	36,8
11	16,6	0	39	65,6	36,78
12	14	0	40	65,6	34,2
13	11,4	0	41	68,2	36,78
14	8,8	0	42	68,2	34,2
15	6,2	0	43	70,8	36,8
16	0	0	44	70,8	34,2
17	19,6	13,3	45	68,2	27,2
18	19,6	10,4	46	70,8	27,2
19	19,6	7,5	47	68,2	24,6
20	0	7	48	70,8	24,6
21	0	19,4	49	68,2	22
22	0	22	50	70,8	22
23	0	24,6	51	68,2	14,8
24	0	27,2	52	70,8	14,8
25	0	29,8	53	68,2	12,2
26	2,9	23,5	54	70,8	12,2
27	2,9	26,4	55	68,2	9,6
28	2,9	29,3	56	70,8	9,6



Pinout



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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.