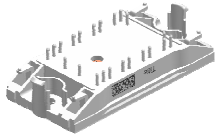
flowNPC 0 **600V/100A**

Features

- symmetric booster
- ultra high switching frequency
- low inductance layout

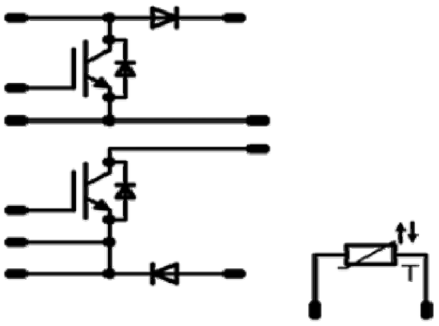
flow0 12mm housing



Target Applications

- solar inverter
- UPS

Schematic



Types

- 10-FZ06NBA100SG10-M305L58

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
BOOST Inverse Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		600	V
DC forward current	I_F	$T_j=T_j$max T_h=80°C T_c=80°C	17 24	A
Maximum repetitive forward current	I_{FRM}	t_p limited by $T_j$max	20	A
Power dissipation per Diode	P_{tot}	$T_j=T_j$max T_h=80°C T_c=80°C	33 50	W
Maximum Junction Temperature	$T_j$max		175	°C
BOOST IGBT				
Collector-emitter break down voltage	V_{CES}		650	V
DC collector current	I_C	$T_j=T_j$max T_h=80°C T_c=80°C	89 118	A
Pulsed collector current	I_{Cpulse}	t_p limited by $T_j$max	300	A
Turn off safe operating area		$T_j \leq 150$°C $V_{CE} <= V_{CES}$	300	A
Power dissipation per IGBT	P_{tot}	$T_j=T_j$max T_h=80°C T_c=80°C	177 268	W
Gate-emitter peak voltage	V_{GE}		±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq 150$°C V_{GE}=15V	5 400	µs V
Turn off safe operating area	$T_j$max		175	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
BOOST FWD					
Peak Repetitive Reverse Voltage	V_{RRM}			650	V
DC forward current	I_F	$T_j=T_j$max	T_h=80°C T_c=80°C	79 102	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max	T_c=100°C	200	A
Power dissipation per Diode	P_{tot}	$T_j=T_j$max	T_h=80°C T_c=80°C	102 155	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

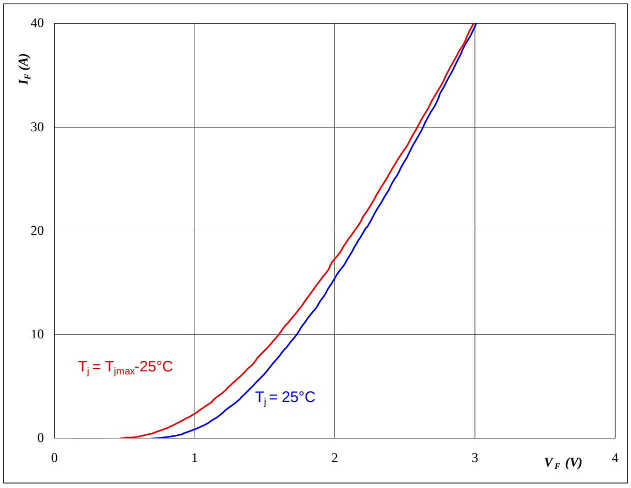
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Input Boost Inverse Diode										
Thermal resistance chip to heatsink per chip	V_F				10	Tj=25°C Tj=125°C	1,25	1,73 1,60	1,95	V
Coupled thermal resistance inverter transistor-diode	R_{thJH}	Phase-Change Material						2,87		K/W
Input Boost IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	VCE=VGE			0,0016	Tj=25°C Tj=125°C	4,2	5,1	5,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		100	Tj=25°C Tj=125°C	1,38	1,86 2,04	2,22	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	650		Tj=25°C Tj=125°C			0,0056	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=125°C			300	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ω Rgon=4 Ω	±15	350	70	Tj=25°C Tj=125°C		31 30		ns
Rise time	t_r					Tj=25°C Tj=125°C		21 23		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=125°C		310 344		
Fall time	t_f					Tj=25°C Tj=125°C		21 12		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		0,92 1,52		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		0,85 1,18		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		6200		pF
Output capacitance	C_{oss}							230		
Reverse transfer capacitance	C_{rss}							180		
Gate charge	Q_{Gate}		±15	480	100	Tj=25°C		630		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Phase-Change Material						0,54		K/W
Input Boost FWD										
Diode forward voltage	V_F				100	Tj=25°C Tj=125°C		2,29 1,69		V
Reserve leakage current	I_r			650		Tj=25°C Tj=125°C			20	µA
Peak reverse recovery current	I_{RRM}	Rgon=4 Ω	0	350	70	Tj=25°C Tj=125°C		58 98		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		24 77		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=125°C		0,91 3,34		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		10422 4048		A/µs
Reverse recovered energy	Erec					Tj=25°C Tj=125°C		0,12 0,58		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Phase-Change Material						0,93		K/W
Thermistor										
Rated resistance	R					T=25°C		22000		Ω
Deviation of R25	$\Delta R/R$	R100=1486 Ω				T=25°C	-5		5	%
Power dissipation	P					T=25°C		200		mW
Power dissipation constant						T=25°C		2		mW/K
B-value	B(25/50)	Tol. ±3%				T=25°C		3950		K
B-value	B(25/100)	Tol. ±3%				T=25°C		3998		K
Vincotech NTC Reference									B	

BOOST Inverse

Figure 1 Boost Inverse Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



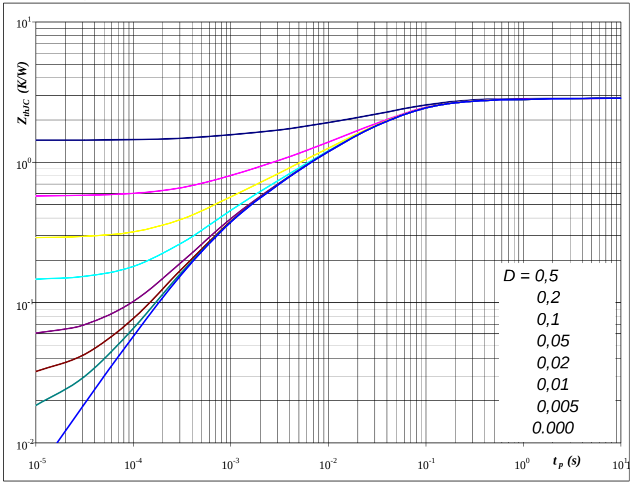
At

t_p = 250 µs

Figure 2 Boost Inverse Diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

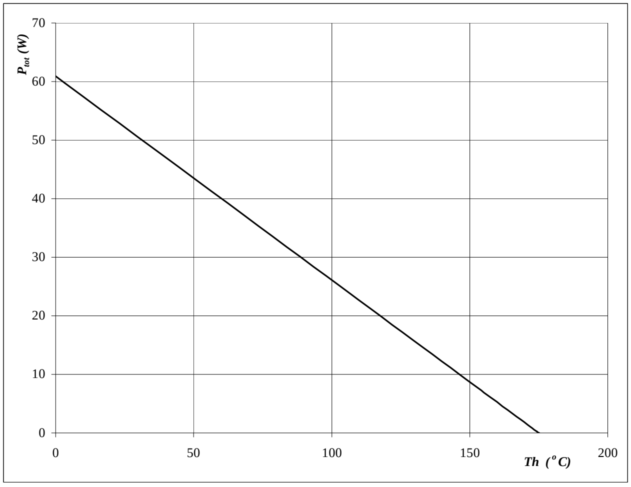
D = tp / T

R_{thJH} = 2,87 K/W

Figure 3 Boost Inverse Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



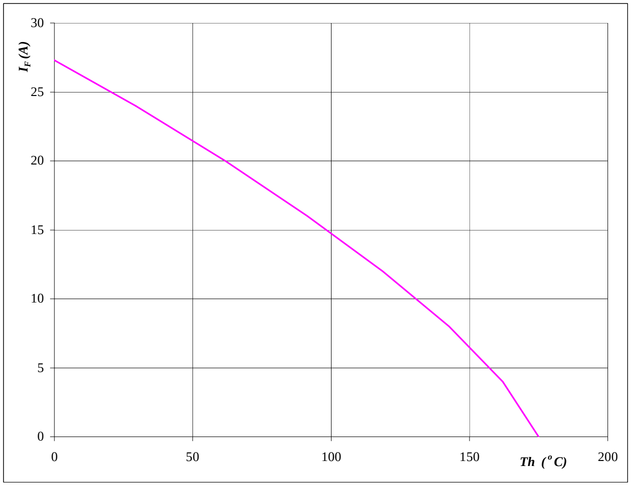
At

T_j = 175 ºC

Figure 4 Boost Inverse Diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

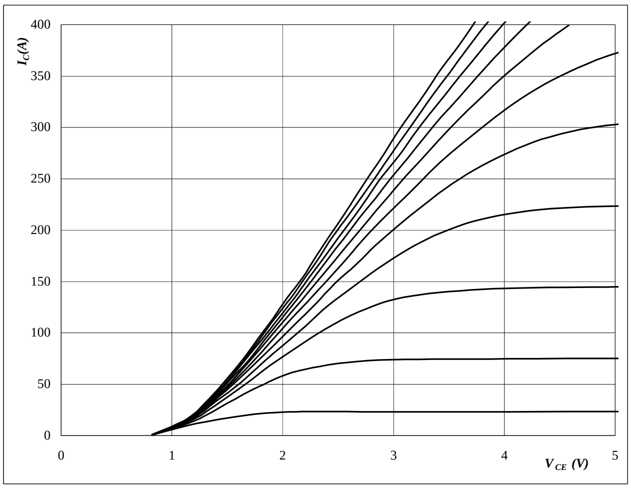
T_j = 175 ºC

BOOST

Figure 5 BOOST IGBT

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

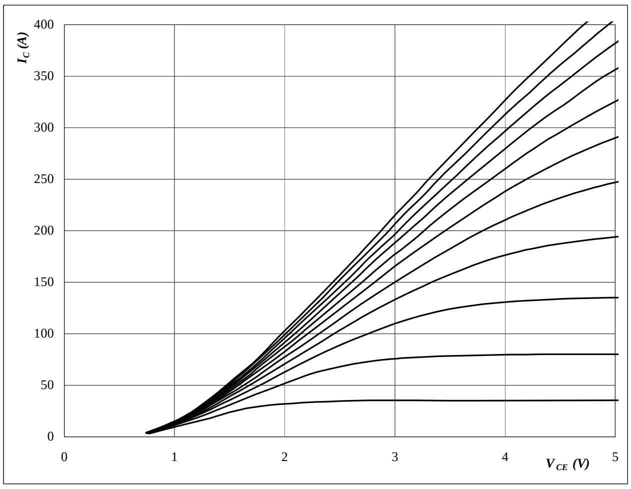
T_j = 25 °C

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

Figure 6 BOOST IGBT

Typical output characteristics

$I_D = f(V_{DS})$



At

t_p = 250 µs

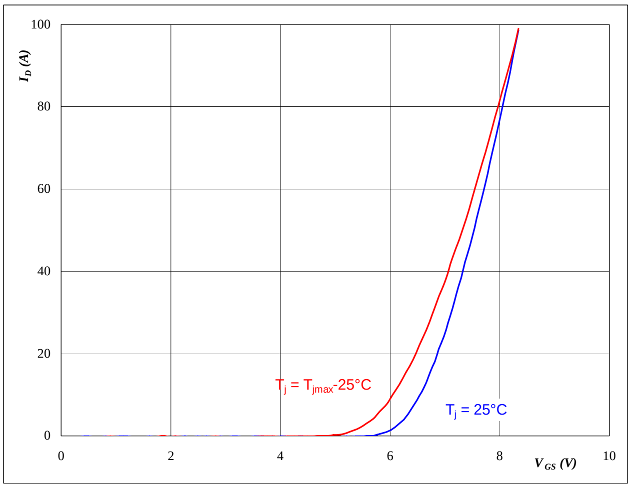
T_j = 125 °C

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

Figure 7 BOOST IGBT

Typical transfer characteristics

$I_D = f(V_{GS})$



At

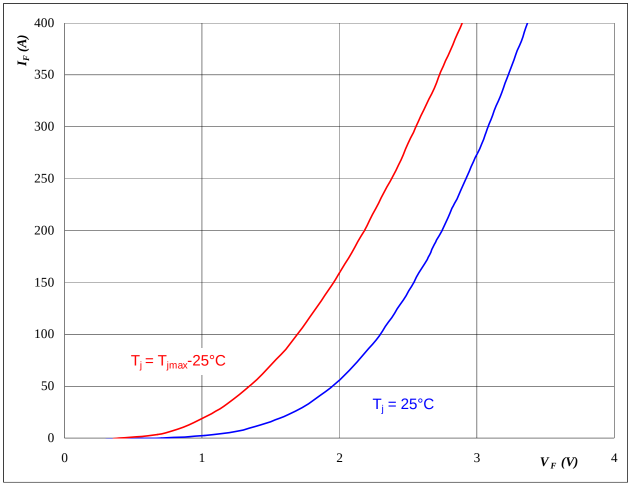
t_p = 250 µs

V_{DS} = 10 V

Figure 8 BOOST FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

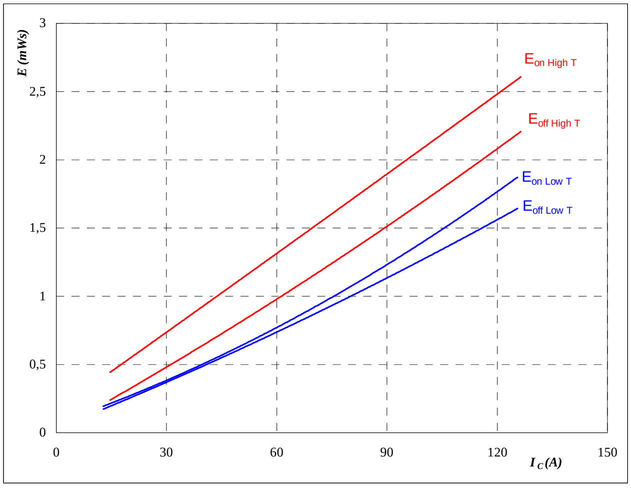
t_p = 250 µs

BOOST

Figure 9 BOOST IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_D)$



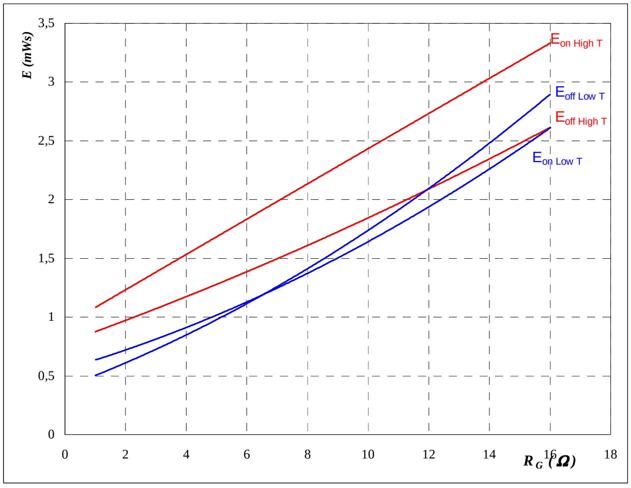
With an inductive load at

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

Figure 10 BOOST IGBT

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



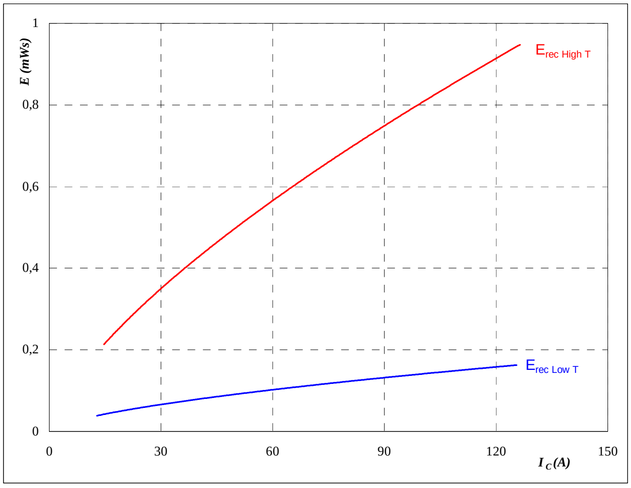
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	15	V
I_C =	71	A

Figure 11 BOOST IGBT

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_c)$



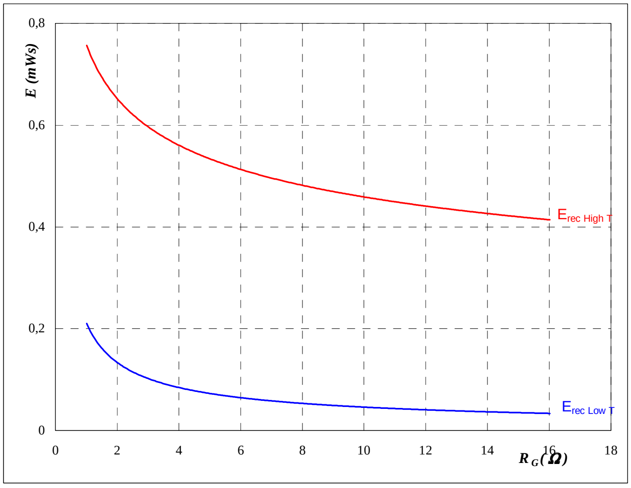
With an inductive load at

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

Figure 12 BOOST IGBT

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

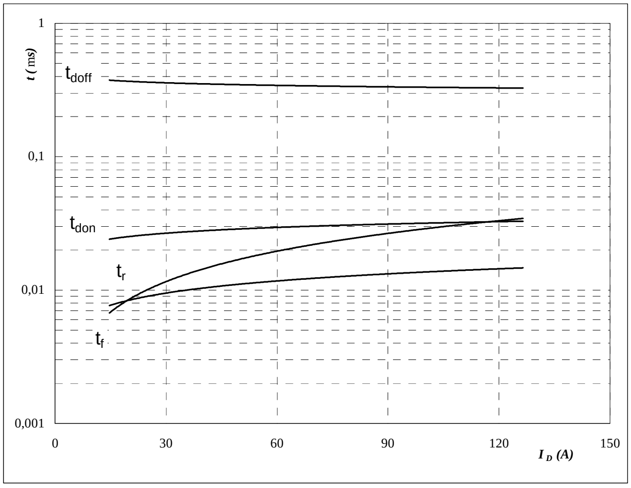
T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	15	V
I_C =	71	A

BOOST

Figure 13 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_{CE} = 350 V

V_{GE} = 15 V

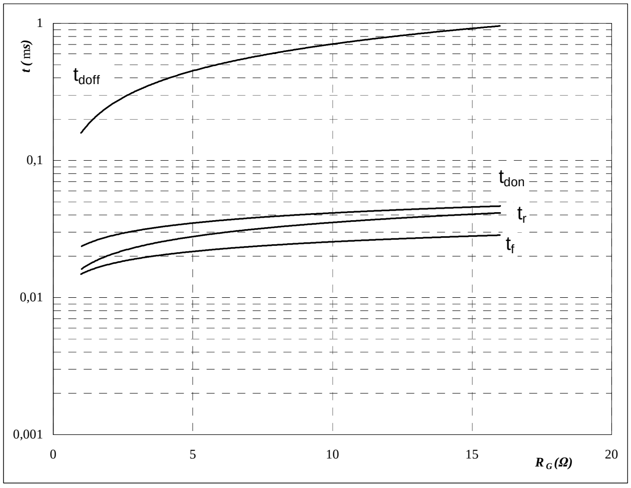
R_{gon} = 4 Ω

R_{goff} = 4 Ω

Figure 14 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_{CE} = 350 V

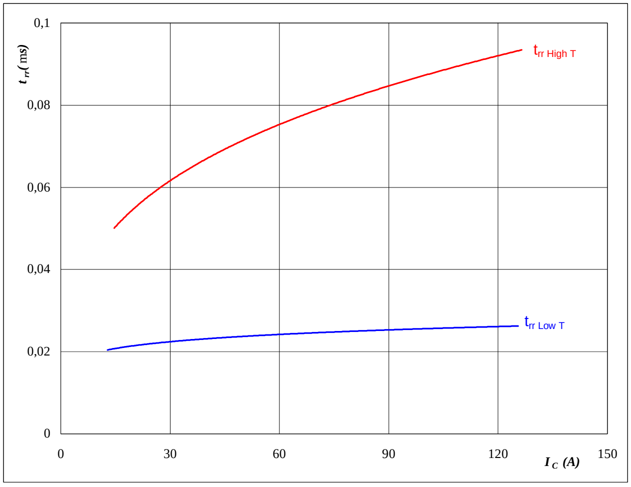
V_{GE} = 15 V

I_C = 71 A

Figure 15 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

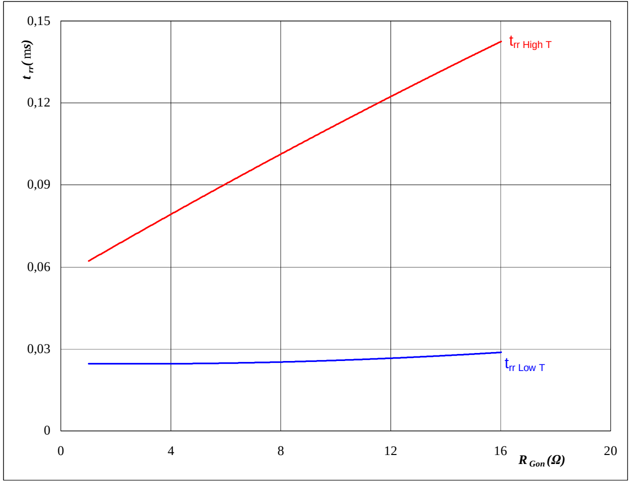
V_{GE} = 15 V

R_{gon} = 4 Ω

Figure 16 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 = 71 A

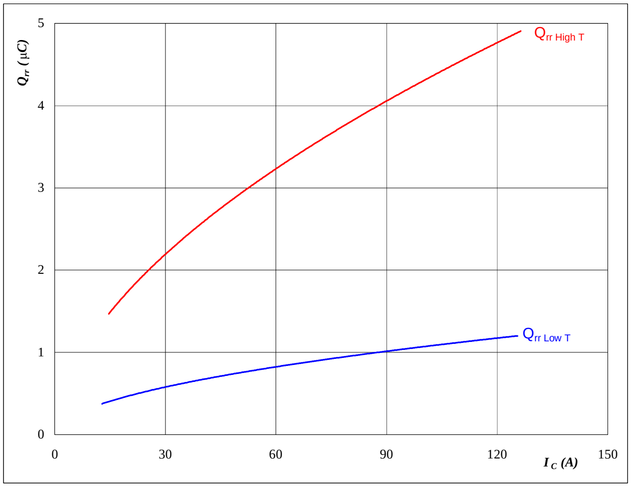
V_{GE} = 15 V

BOOST

Figure 17 BOOST FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



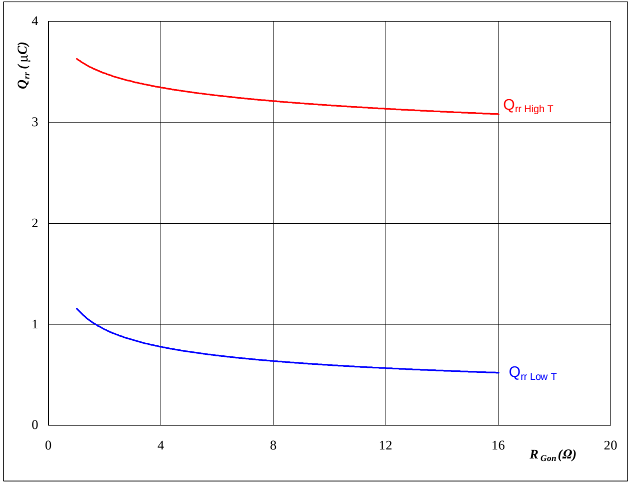
At

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

Figure 18 BOOST FWD

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

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



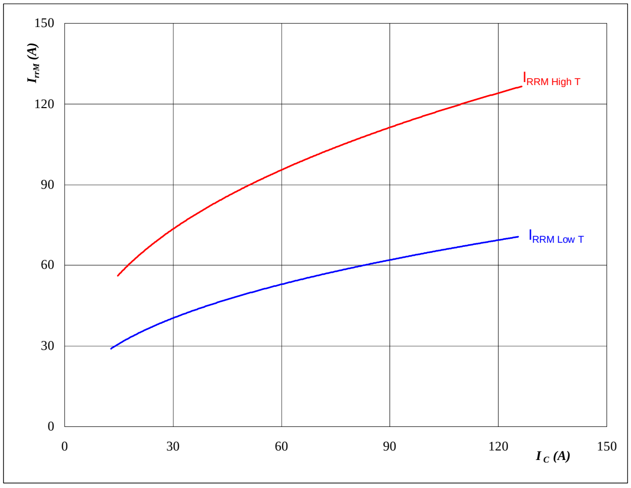
At

Tj =	25/125	°C
VR =	350	V
IF =	71	A
V_{GE} =	15	V

Figure 19 BOOST FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



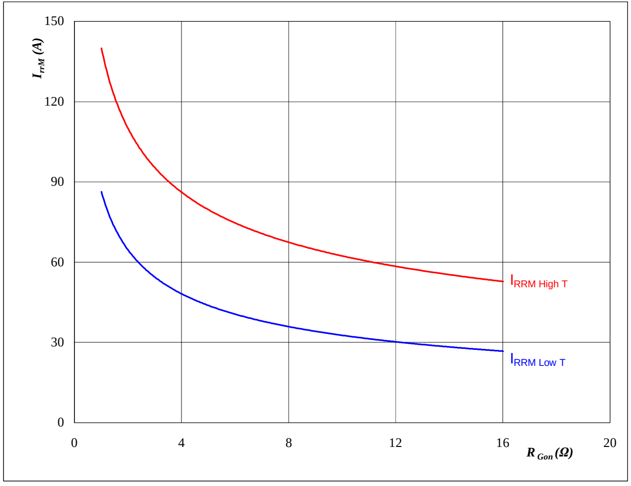
At

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

Figure 20 BOOST FWD

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

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



At

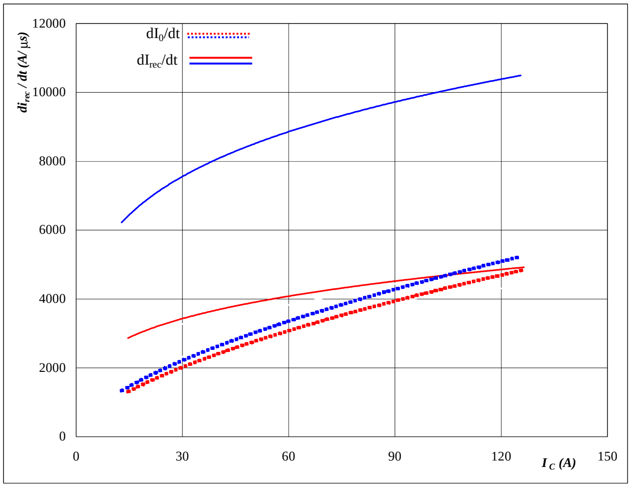
T_j =	25/125	°C
V_R =	350	V
I_F =	71	A
V_{GE} =	15	V

BOOST

Figure 21 BOOST FWD

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

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



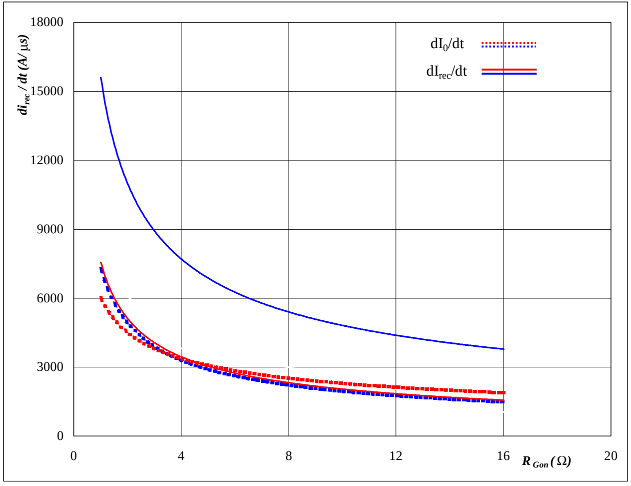
At

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

Figure 22 BOOST FWD

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

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



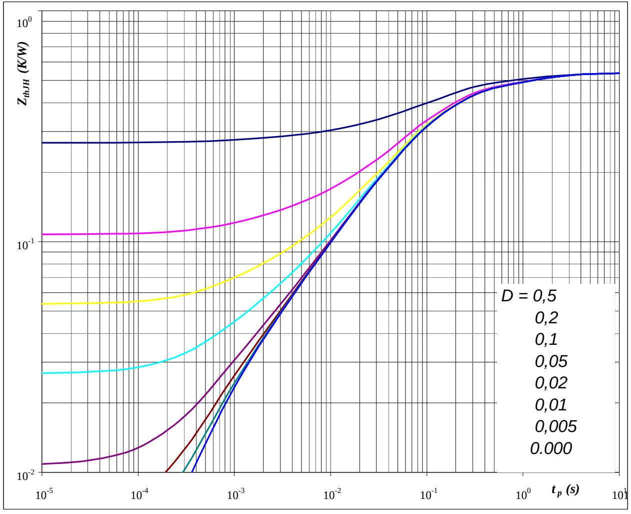
At

Tj =	25/125	°C
VR =	350	V
IF =	71	A
V_{GE} =	15	V

Figure 23 BOOST IGBT

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0,54	K/W

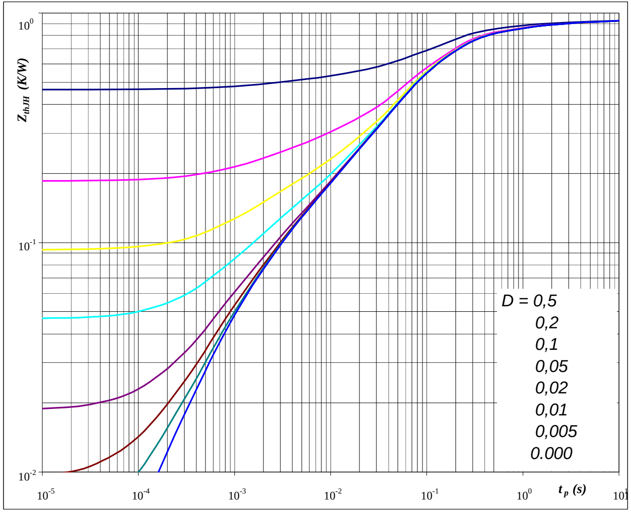
IGBT thermal model values

R (C/W)	Tau (s)
9,03E-02	1,44E+00
1,74E-01	1,82E-01
1,93E-01	5,93E-02
5,65E-02	9,38E-03
2,20E-02	1,07E-03

Figure 24 BOOST FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0,93	K/W

FWD thermal model values

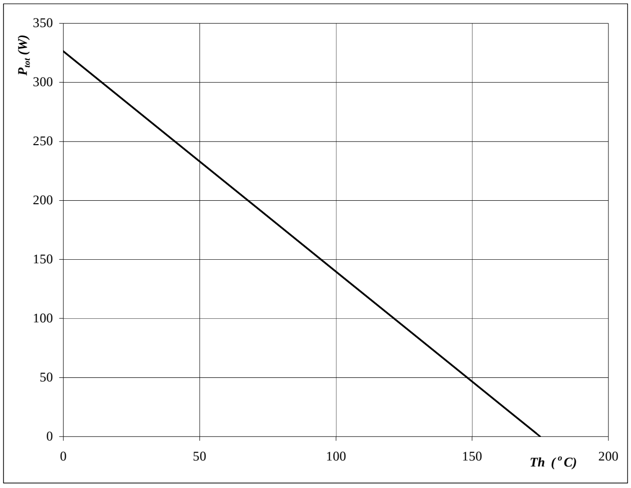
R (C/W)	Tau (s)
6,93E-02	3,04E+00
1,64E-01	4,75E-01
5,02E-01	9,73E-02
8,20E-02	2,48E-02
6,58E-02	4,90E-03
4,43E-02	1,04E-03

BOOST

Figure 25 BOOST IGBT

Power dissipation as a
function of heatsink temperature

$P_{tot} = f(T_h)$



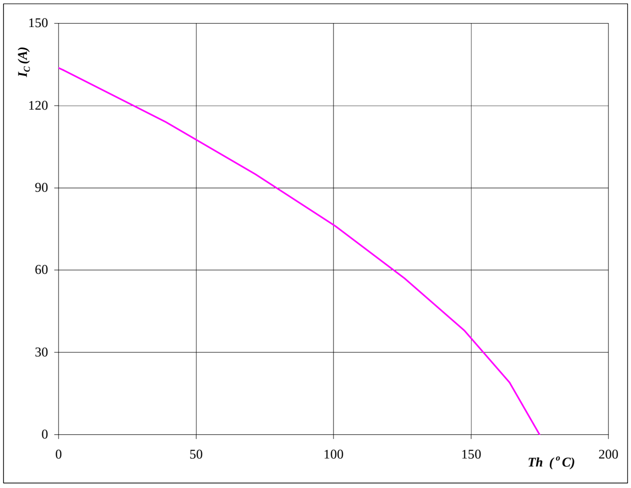
At

T_j = 175 ºC

Figure 26 BOOST IGBT

Collector current as a
function of heatsink temperature

$I_C = f(T_h)$



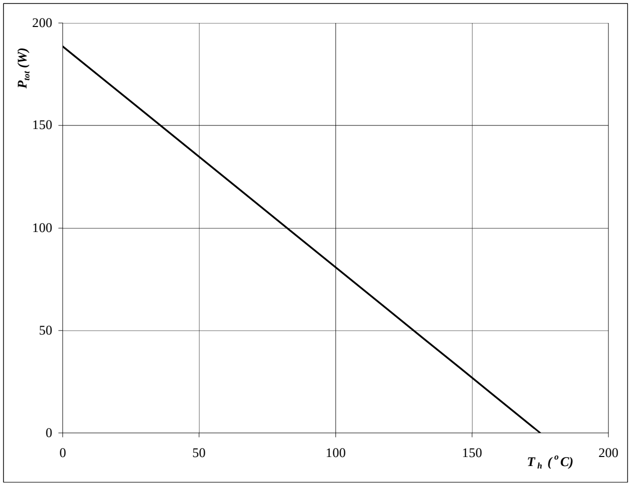
At

T_j = 175 ºC
V_{GE} = 15 V

Figure 27 BOOST FWD

Power dissipation as a
function of heatsink temperature

$P_{tot} = f(T_h)$



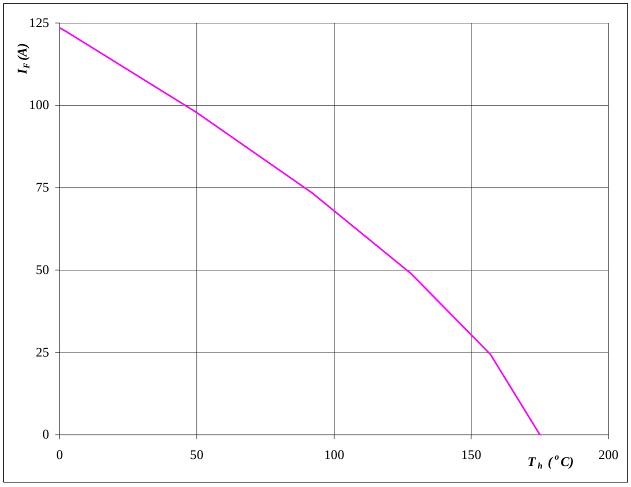
At

T_j = 175 ºC

Figure 28 BOOST FWD

Forward current as a
function of heatsink temperature

$I_F = f(T_h)$



At

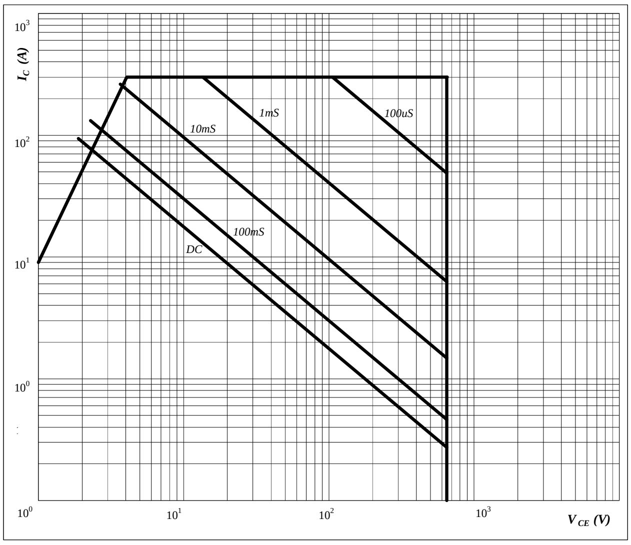
T_j = 175 ºC

BOOST

Figure 29 BOOST IGBT

Safe operating area as a function of collector-emitter voltage

$I_D = f(V_{DS})$



At

D = single pulse

T_h = 80 ºC

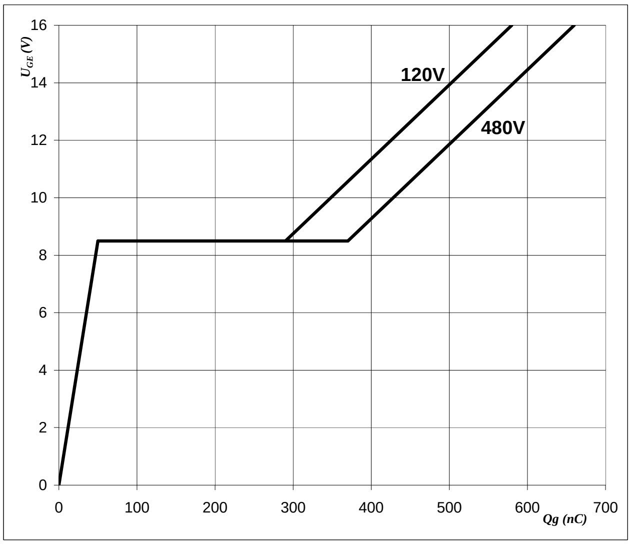
V_{GE} = 15 V

T_j = T_{jmax} ºC

Figure 30 BOOST IGBT

Gate voltage vs Gate charge

$V_{GS} = f(Qg)$



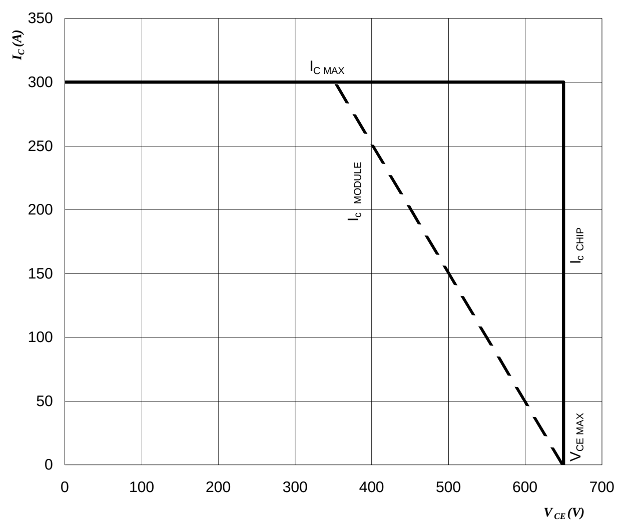
At

I_C = 100 A

Figure 31 BOOST IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = 125 ºC

$U_{ccminus}$=U_{ccplus}

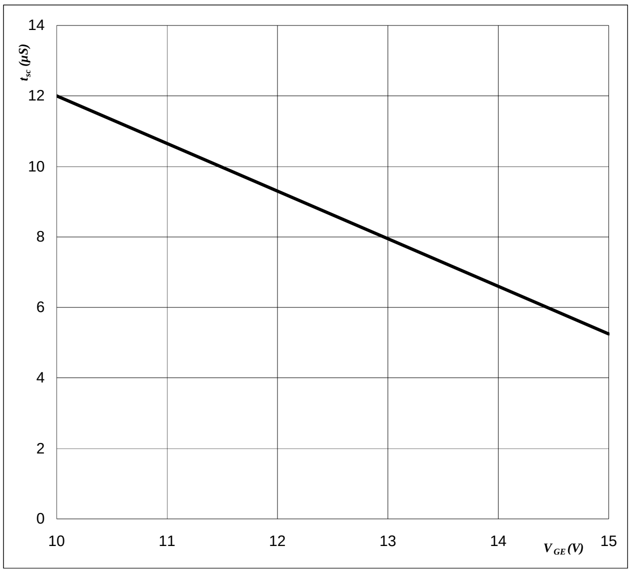
R_{goff} = 4 Ω

BOOST

Figure 32 BOOST IGBT

Short circuit withstand time as a function of gate-emitter voltage

$t_{sc} = f(V_{GE})$



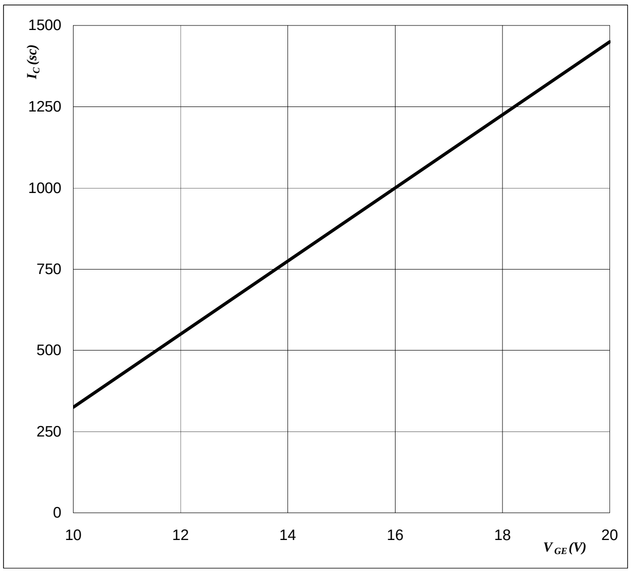
At

V_{CE} =	400	V
T_j ≤	150	ºC

Figure 33 BOOST IGBT

Typical short circuit collector current as a function of gate-emitter voltage

$V_{GE} = f(Q_{GE})$



At

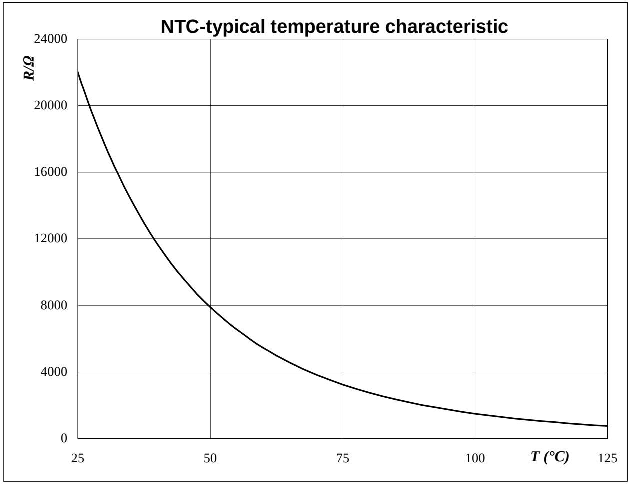
V_{CE} ≤	400	V
T_j =	25	ºC

Thermistor

Figure 34 Thermistor

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$



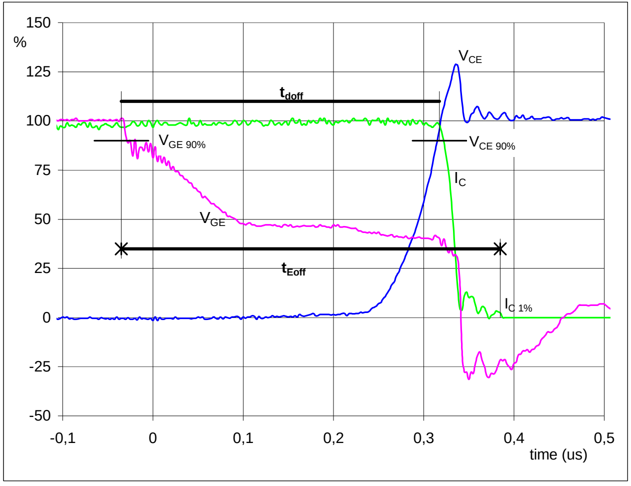
Switching Definitions BUCK IGBT

General conditions

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

Figure 1 BOOST IGBT

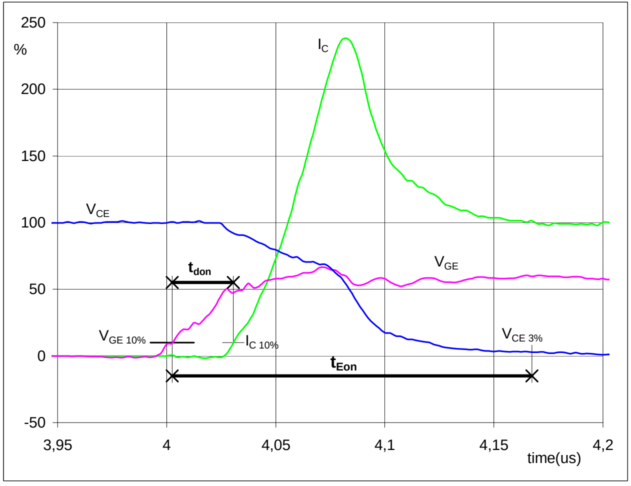
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) = 0 V
V_{GE} (100%) = 15 V
V_{C} (100%) = 350 V
I_{C} (100%) = 71 A
t_{doff} = 0,34 μs
t_{Eoff} = 0,42 μs

Figure 2 BOOST IGBT

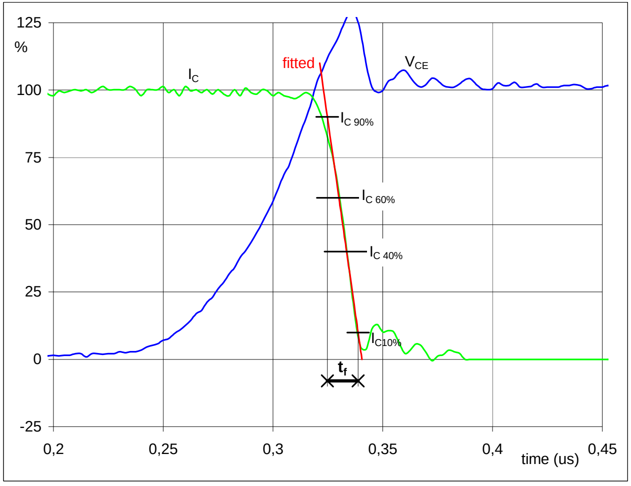
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) = 0 V
V_{GE} (100%) = 15 V
V_{C} (100%) = 350 V
I_{C} (100%) = 71 A
t_{don} = 0,03 μs
t_{Eon} = 0,16 μs

Figure 3 BOOST IGBT

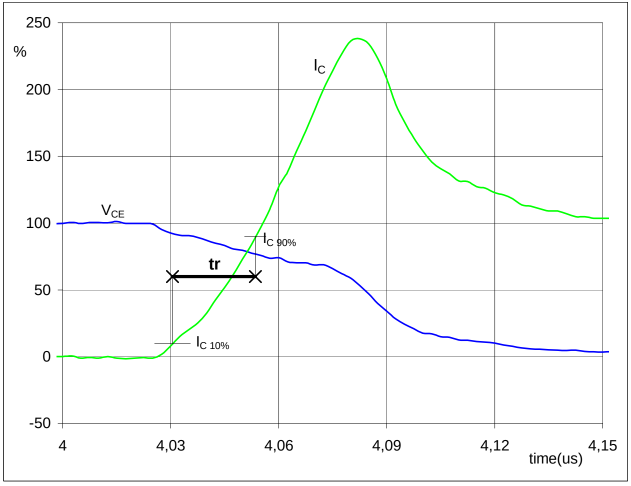
Turn-off Switching Waveforms & definition of t_f



V_{C} (100%) = 350 V
I_{C} (100%) = 71 A
t_f = 0,012 μs

Figure 4 BOOST IGBT

Turn-on Switching Waveforms & definition of t_r

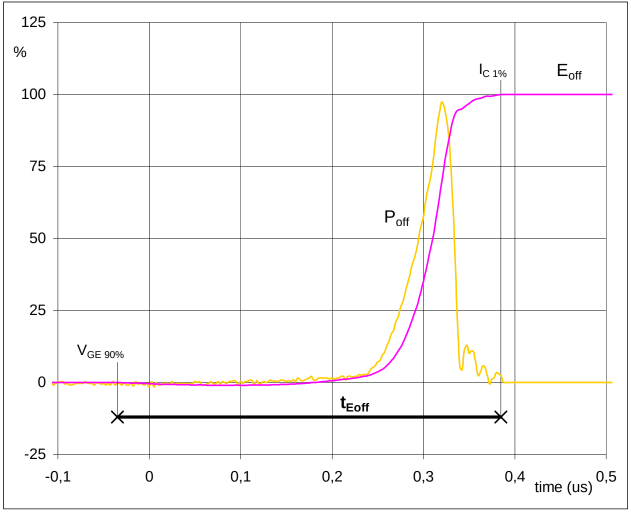


V_{C} (100%) = 350 V
I_{C} (100%) = 71 A
t_r = 0,023 μs

Switching Definitions BUCK IGBT

Figure 5 BOOST IGBT

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



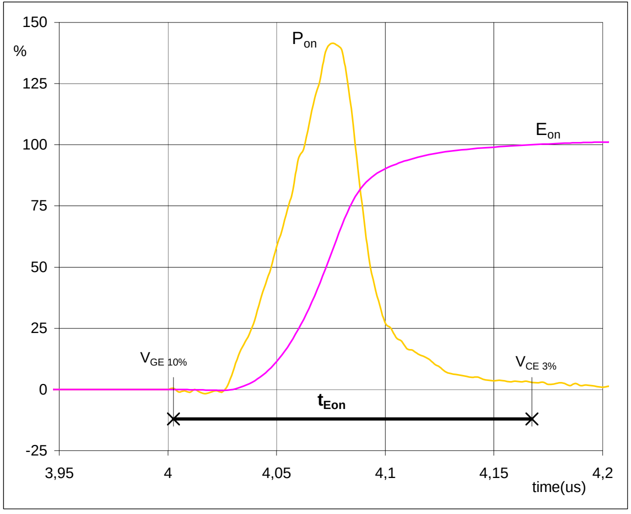
P_{off} (100%) = 24,75 kW

E_{off} (100%) = 1,18 mJ

t_{Eoff} = 0,42 µs

Figure 6 BOOST IGBT

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



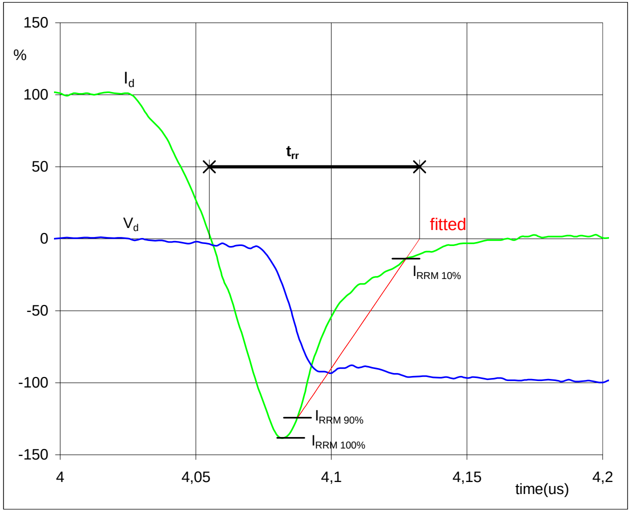
P_{on} (100%) = 24,75 kW

E_{on} (100%) = 1,52 mJ

t_{Eon} = 0,16 µs

Figure 7 BOOST FWD

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



V_d (100%) = 350 V

I_d (100%) = 71 A

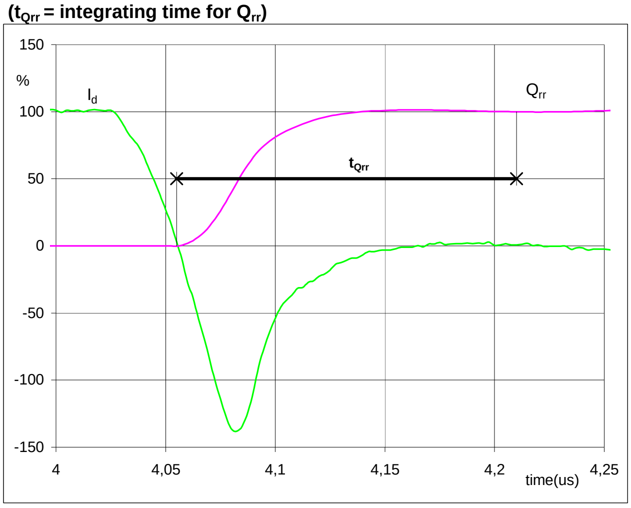
I_{RRM} (100%) = -98 A

t_{rr} = 0,08 µs

Switching Definitions BUCK IGBT

Figure 8 BOOST FWD

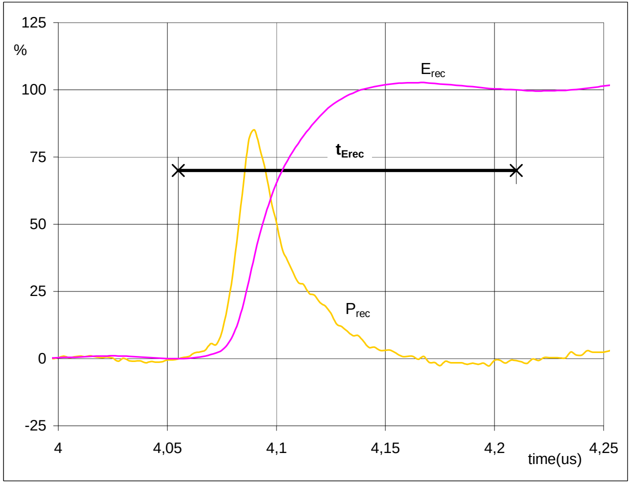
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) = 71 A
Q_{rr} (100%) = 3,34 μC
t_{Qrr} = 0,15 μs

Figure 9 BOOST FWD

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



P_{rec} (100%) = 24,75 kW
E_{rec} (100%) = 0,58 mJ
t_{Erec} = 0,15 μs

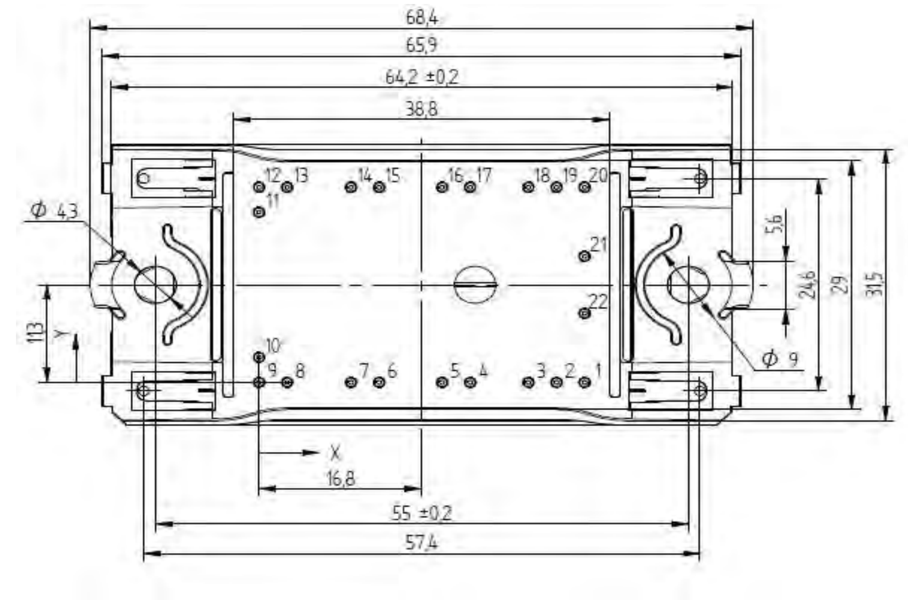
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

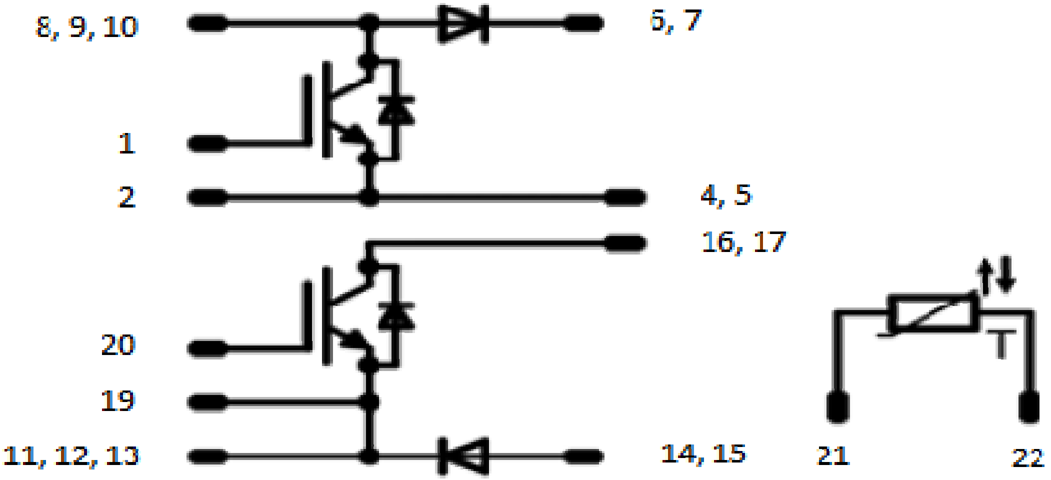
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FZ06NBA100SG10-M305L58	M305L58	M305L58

Outline

Pin table		
Pin	X	Y
1	33,6	0
2	30,7	0
3	27,8	0
4	21,8	0
5	18,9	0
6	12,4	0
7	9,5	0
8	2,9	0
9	0	0
10	0	2,9
11	0	19,7
12	0	22,6
13	2,9	22,6
14	9,5	22,6
15	12,4	22,6
16	18,9	22,6
17	21,8	22,6
18	27,8	22,6
19	30,7	22,6
20	33,6	22,6
21	33,6	14,6
22	33,6	8



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.