10-FY06BIA050SG-M523E18

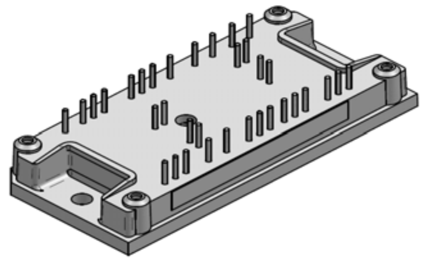
preliminary datasheet

flowSOL 1 BI — **600V/50A**

Features

- Low inductive 12mm flow1 package
- Booster:
  - Dual boost topology
  - High-speed IGBT + ultrafast FWD
  - Bypass rectifier
- Inverter:
  - H-bridge topology
  - High-speed IGBT + ultrafast FWD
- Integrated DC-capacitors
- Temperature sensor

flow1 12mm housing

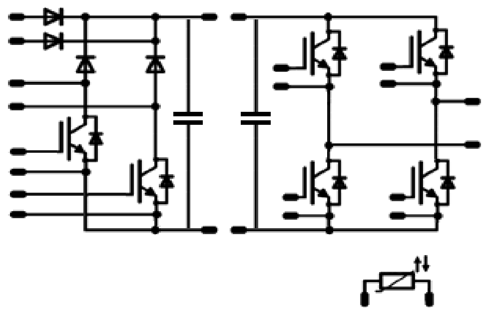


Target Applications

- Solar Inverter:

Transformer-less solar inverter with bipolar modulation with high efficiency/cost ratio
Primary of a transformer based solar inverter with resonant switching

Schematic



Types

- 10-FY06BIA050SG-M523E18

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Bypass Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
Forward current per diode	I_{FAV}	DC current	T_h=80℃ T_c=80℃	39 53	A
Surge forward current	I_{FSM}	t_p=10ms	T_j=25℃	370	A
I2t-value	I^2t			370	A^2s
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80℃ T_c=80℃	46 69	W
Maximum Junction Temperature	$T_j$max			150	℃
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℃ T_c=80℃	39 52	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by $T_j$max		150	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max	T_h=80℃ T_c=80℃	83 126	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150℃ V_{GE}=15V		5 400	µs V
Maximum Junction Temperature	$T_j$max			175	℃

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Boost Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25℃		600	V
DC forward current	I_F	T_j=$T_j$max	T_h=80℃ T_c=80℃	19 25	A
Repetitive peak 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℃ T_c=80℃	39 47	W
Maximum Junction Temperature	$T_j$max			150	℃
Input Boost Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25℃		600	V
DC forward current	I_F	T_j=$T_j$max	T_h=80℃ T_c=80℃	23 27	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℃ T_c=80℃	40 60	W
Maximum Junction Temperature	$T_j$max			150	℃
H-Bridge IGBT					
Collector-emitter break down voltage	V_{CE}	T_j=25℃		600	V
DC collector current	I_C	T_j=$T_j$max	T_h=80℃ T_c=80℃	39 52	A
Repetitive peak collector current	Icpulse	t_p limited by $T_j$max		150	A
Power dissipation per IGBT	P_{tot}	T_j=$T_j$max	T_h=80℃ T_c=80℃	83 126	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150℃ V_{GE}=15V		5 400	μs V
Maximum Junction Temperature	$T_j$max			175	℃
H-Bridge Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25℃		600	V
DC forward current	I_F	T_j=$T_j$max	T_h=80℃ T_c=80℃	23 31	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		120	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80℃ T_c=80℃	40 60	W
Maximum Junction Temperature	$T_j$max			150	℃
DC link Capacitor					
Max.DC voltage	V_{MAX}		Tc=25℃	630	V

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	℃
Operation temperature under switching condition	T_{op}		-40…+(Tjmax - 25)	℃
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	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	Unit
Bypass Diode										
Forward voltage	V_F				35	Tj=25℃ Tj=125℃		1,16 1,11	1,21	V
Threshold voltage (for power loss calc. only)	V_{to}				35	Tj=25℃ Tj=125℃		0,90 0,76		V
Slope resistance (for power loss calc. only)	r_t				35	Tj=25℃ Tj=125℃		0,01 0,01		Ŏ
Reverse current	I_r			1600		Tj=25℃ Tj=125℃			0,05	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,53		K/W
Input Boost IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$				0,0008	Tj=25℃ Tj=125℃	4,1	4,9	5,7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15	0	50	Tj=25℃ Tj=125℃		1,94 2,22	2	V
Collector-emitter cut-off	I_{CES}		0	600		Tj=25℃ Tj=125℃			0,04	mA
Gate-emitter leakage current	I_{GES}		20			Tj=25℃ Tj=125℃			100	nA
Integrated Gate resistor	R_{gint}							none		Ŏ
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ŏ Rgon=4 Ŏ	±15	400	50	Tj=25℃ Tj=125℃		23 21		ns
Rise time	t_r					Tj=25℃ Tj=125℃		13 14		
Turn-off delay time	$t_{d(off)}$					Tj=25℃ Tj=125℃		185 207		
Fall time	t_f					Tj=25℃ Tj=125℃		5 7		
Turn-on energy loss per pulse	E_{on}					Tj=25℃ Tj=125℃		0,62 0,96		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25℃ Tj=125℃		0,47 0,71		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25℃		3140		pF
Output capacitance	C_{oss}							200		
Reverse transfer capacitance	C_{rss}							93		
Gate charge	Q_{Gate}	f=1MHz	0	25		Tj=25℃		310		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,15		K/W
Input Boost Inverse Diode										
Diode forward voltage	V_F				10	Tj=25℃ Tj=125℃	1,25	1,67 1,56	1,95	V
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						2,44		K/W
Input Boost Diode										
Forward voltage	V_F				30	Tj=25℃ Tj=125℃		2,34 2,01	2,6	V
Reverse leakage current	I_{rm}		±15	400	50	Tj=25℃ Tj=125℃			100	µA
Peak recovery current	I_{RRM}	Rgon=4 Ŏ	±15	400	50	Tj=25℃ Tj=125℃		47 72		A
Reverse recovery time	t_{rr}					Tj=25℃ Tj=125℃		15 29		ns
Reverse recovery charge	Q_{rr}					Tj=25℃ Tj=125℃		0,51 1,23		µC
Reverse recovered energy	E_{rec}					Tj=25℃ Tj=125℃		0,07 0,16		mWs
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25℃ Tj=125℃		15400 10220		A/µs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,76		K/W

Characteristic Values

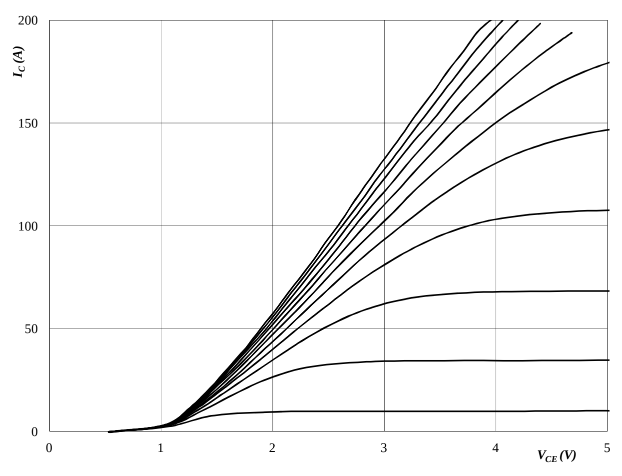
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
H-Bridge IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	VGE=VCE			0,0008	Tj=25℃ Tj=125℃	4,1	4,9	5,7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15	0	50	Tj=25℃ Tj=125℃		1,94 2,22	2	V
Collector-emitter cut-off incl diode	I_{CES}		0	600		Tj=25℃ Tj=125℃			0,04	mA
Gate-emitter leakage current	I_{GES}		20			Tj=25℃ Tj=125℃			100	nA
Integrated Gate resistor	R_{gint}					Tj=25℃ Tj=125℃		none		Ŏ
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ŏ Rgon=4 Ŏ	±15	400	50	Tj=25℃ Tj=125℃		22 22		ns
Rise time	t_r					Tj=25℃ Tj=125℃		13 14		ns
Turn-off delay time	$t_{d(off)}$					Tj=25℃ Tj=125℃		182 204		ns
Fall time	t_f					Tj=25℃ Tj=125℃		4 7		ns
Turn-on energy loss per pulse	E_{on}					Tj=25℃ Tj=125℃		0,61 0,89		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25℃ Tj=125℃		0,42 0,67		mWs
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25℃		3140		pF
Output capacitance	C_{oss}							200		pF
Reverse transfer capacitance	C_{rss}							93		pF
Gate charge	Q_{Gate}		±15	480	50	Tj=25℃		310		nC
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,15		K/W
H-Bridge Diode										
Diode forward voltage	V_F				50	Tj=25℃ Tj=125℃		2,33 2,01	2,6	V
Peak reverse recovery current	I_{RRM}	Rgon=4 Ŏ	±15	400	50	Tj=25℃ Tj=125℃		51 75		A
Reverse recovery time	t_{rr}					Tj=25℃ Tj=125℃		16 29		ns
Reverse recovered charge	Q_{rr}					Tj=25℃ Tj=125℃		0,49 1,24		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25℃ Tj=125℃		14960 10600		A/µs
Reverse recovery energy	E_{rec}					Tj=25℃ Tj=125℃		0,06 0,18		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1,76		K/W
DC link Capacitor										
C value	C							47		nF
Thermistor										
Rated resistance	R					T=25℃		22000		Ŏ
Deviation of R25	ΔR/R	R100=1486 Ŏ				T=25℃	-5		+5	%
Power dissipation	P					T=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									B	

H-Bridge

Figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



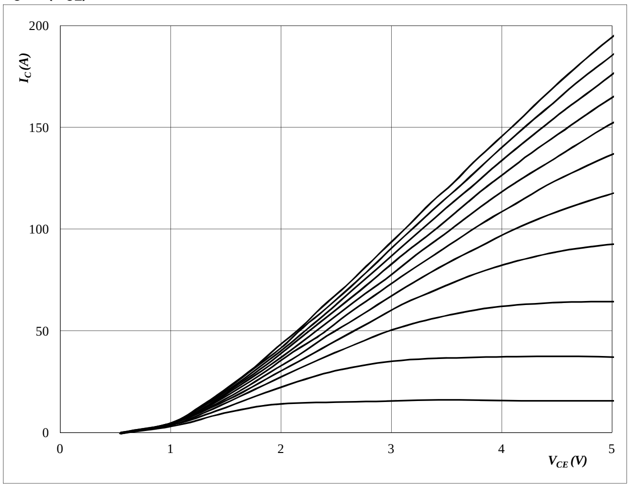
At

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

Figure 2 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



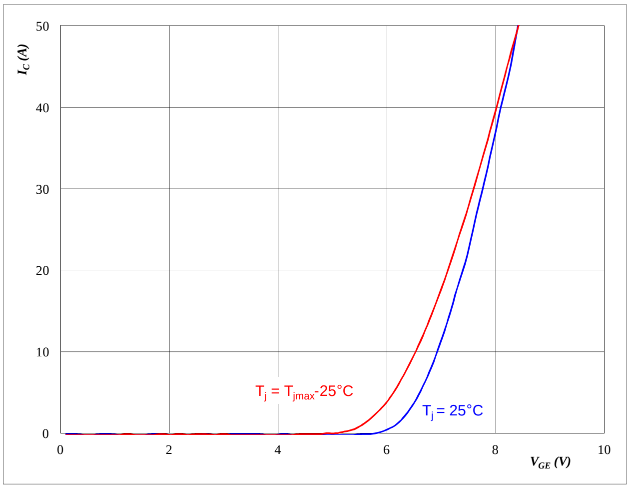
At

t_p =	250	µs
T_j =	125	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 3 IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



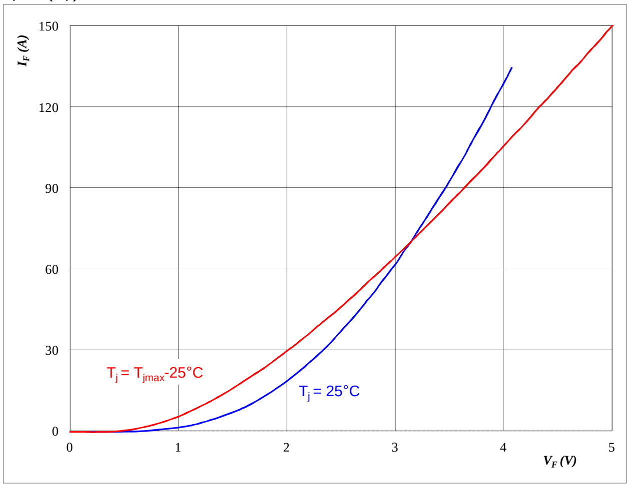
At

t_p =	250	µs
V_{CE} =	10	V

Figure 4 FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



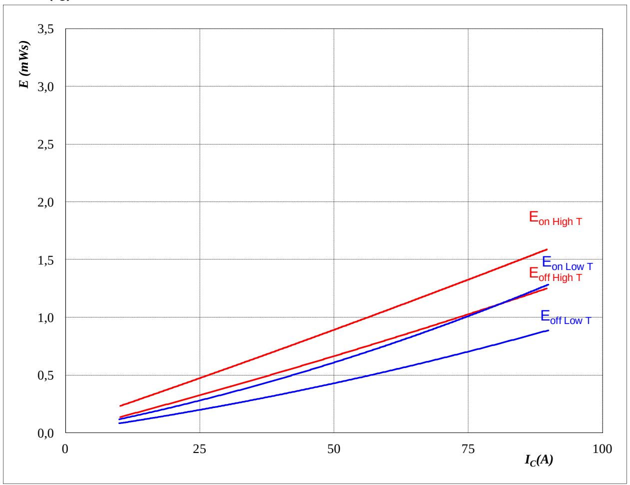
At

t_p =	250	µs

H-Bridge

Figure 5	IGBT

Typical switching energy losses
as a function of collector current
$E = f(I_C)$

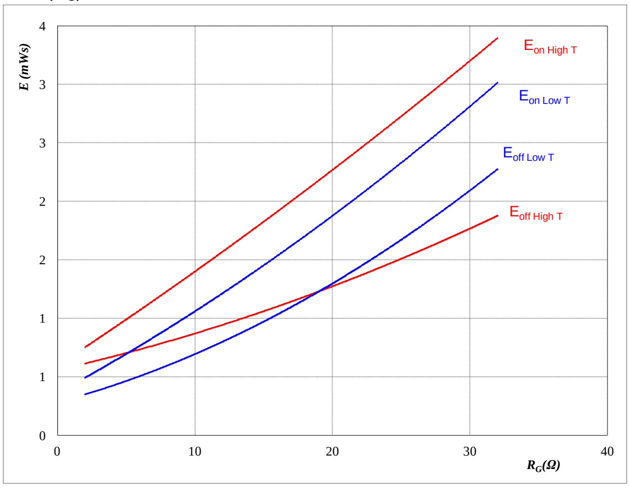


With an inductive load at

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ǒ
R_{goff} =	4	Ǒ

Figure 6	IGBT

Typical switching energy losses
as a function of gate resistor
$E = f(R_G)$

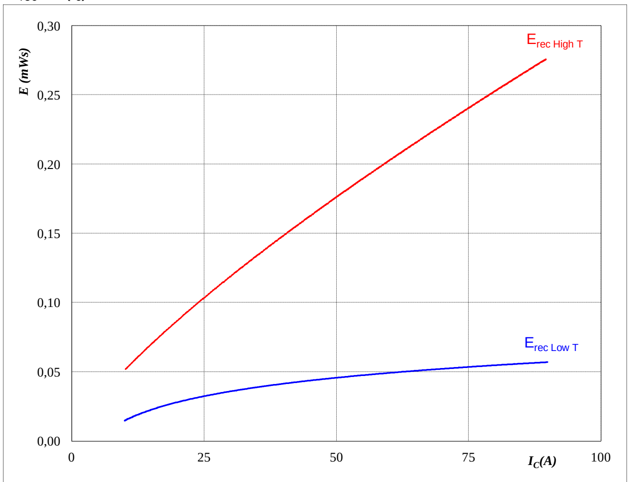


With an inductive load at

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
I_C =	50	A

Figure 7	FWD

Typical reverse recovery energy loss
as a function of collector current
$E_{rec} = f(I_c)$

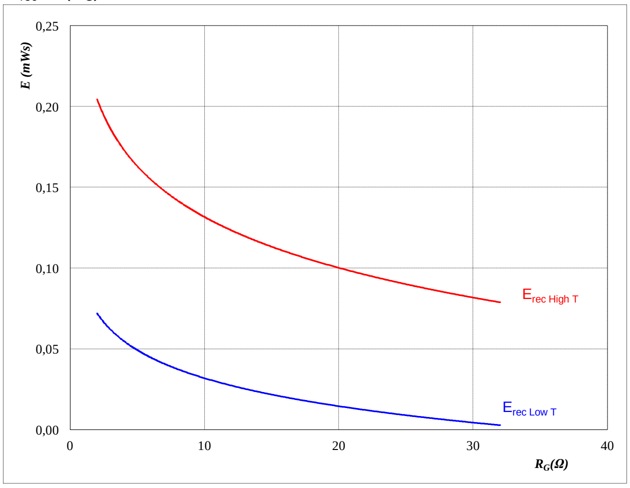


With an inductive load at

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ǒ

Figure 8	FWD

Typical reverse recovery energy loss
as a function of gate resistor
$E_{rec} = f(R_G)$



With an inductive load at

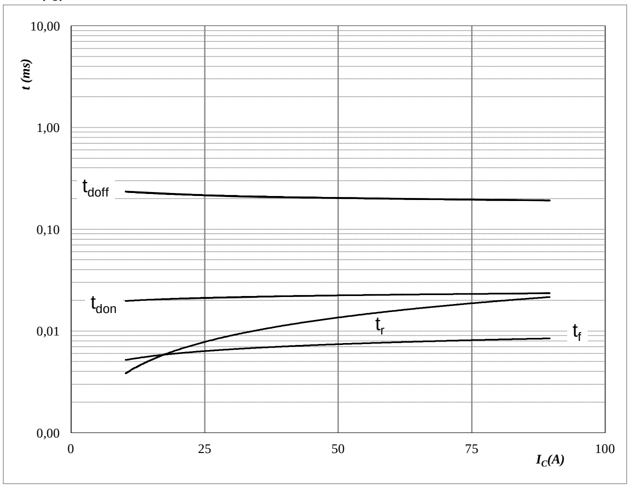
T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
I_C =	50	A

H-Bridge

Figure 9 IGBT

Typical switching times as a function of collector current

t = f(I_C)



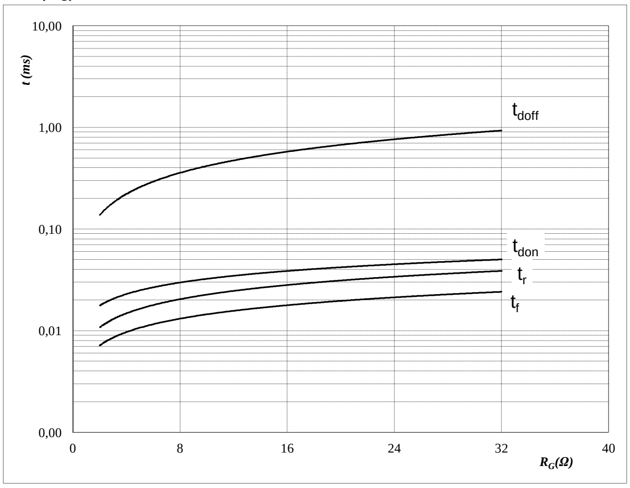
With an inductive load at

T_j =	125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ő
R_{goff} =	4	Ő

Figure 10 IGBT

Typical switching times as a function of gate resistor

t = f(R_G)



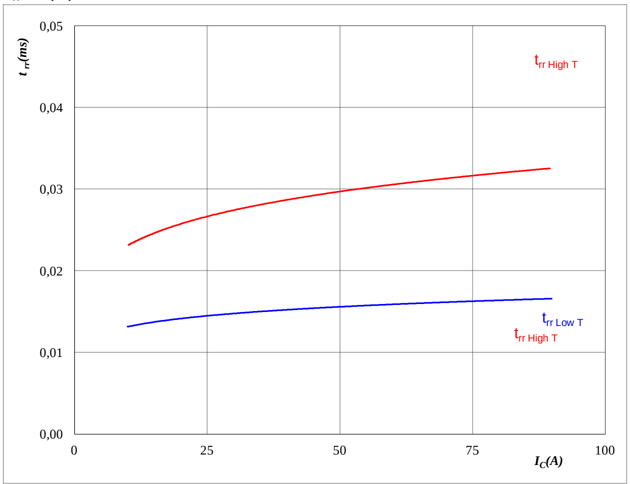
With an inductive load at

T_j =	125	℃
V_{CE} =	400	V
V_{GE} =	15	V
I_C =	50	A

Figure 11 FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



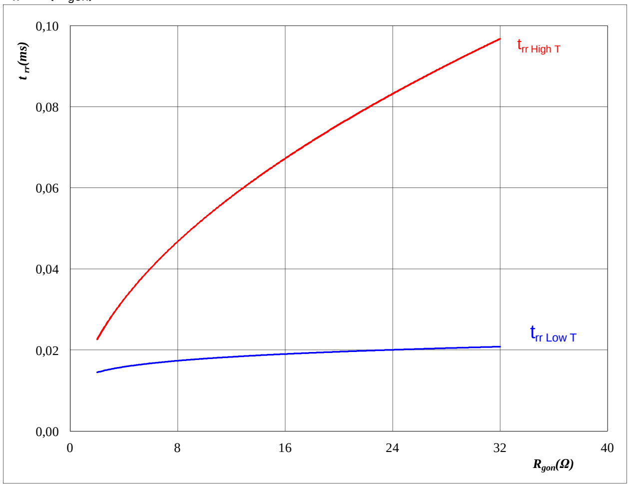
At

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ő

Figure 12 FWD

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

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



At

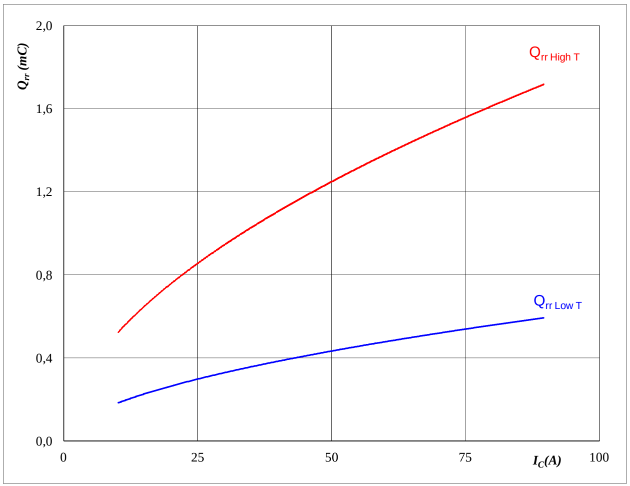
T_j =	25/125	℃
V_R =	400	V
I_F =	50	A
V_{GE} =	15	V

H-Bridge

Figure 13 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



At

T_j = 25/125 ℃

V_{CE} = 400 V

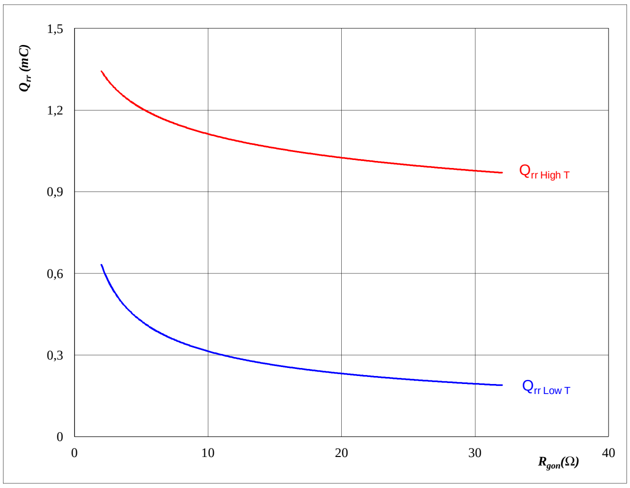
V_{GE} = 15 V

R_{gon} = 4 Ŏ

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 ℃

V_R = 400 V

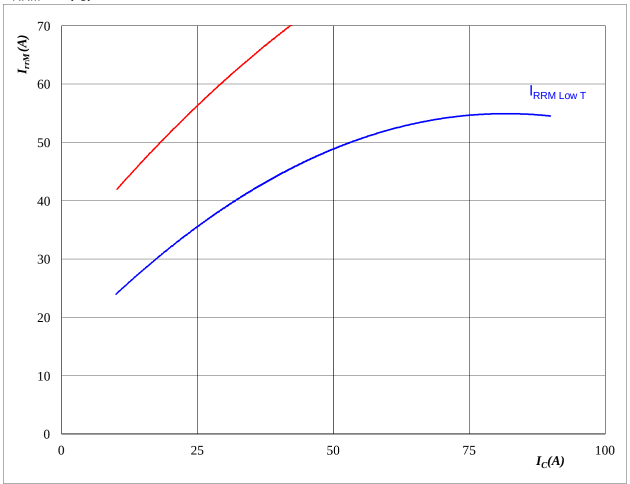
I_F = 50 A

V_{GE} = 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 ℃

V_{CE} = 400 V

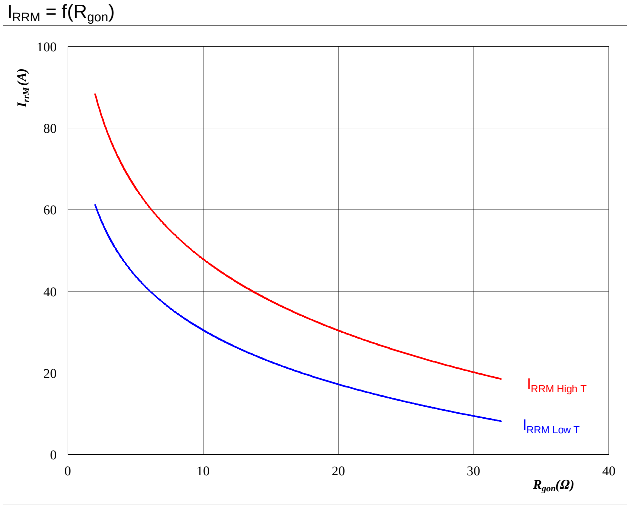
V_{GE} = 15 V

R_{gon} = 4 Ŏ

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 ℃

V_R = 400 V

I_F = 50 A

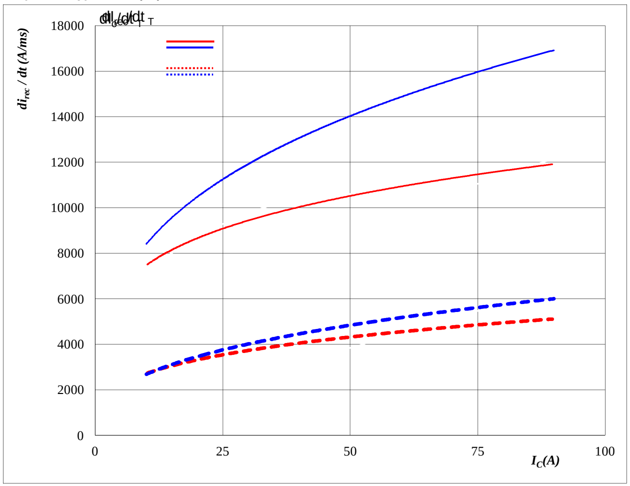
V_{GE} = 15 V

H-Bridge

Figure 17 FWD

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

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



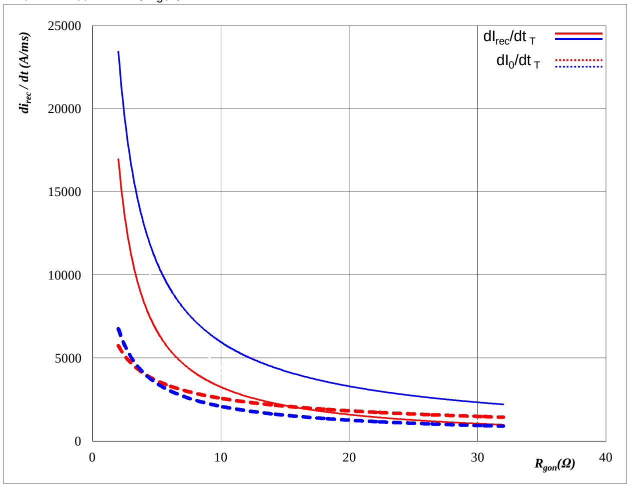
At

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ŏ

Figure 18 FWD

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

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



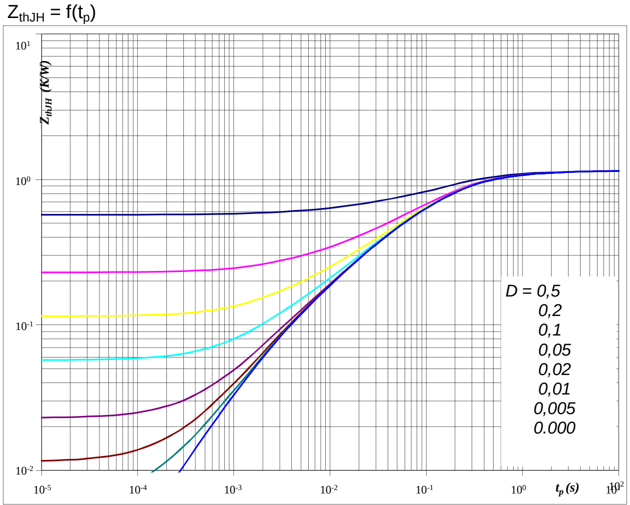
At

T_j =	25/125	℃
V_R =	400	V
I_F =	50	A
V_{GE} =	15	V

Figure 19 IGBT

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1,15	K/W

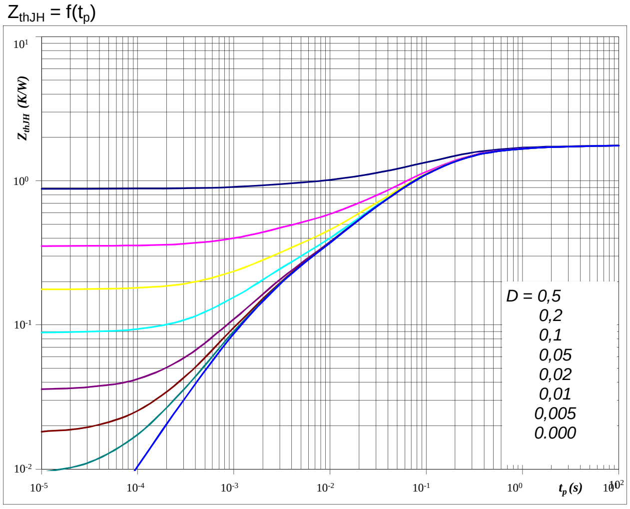
IGBT thermal model values

R (C/W)	Tau (s)
0,09	2,0E+00
0,33	3,2E-01
0,51	9,4E-02
0,16	1,5E-02
0,05	2,3E-03

Figure 20 FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1,76	K/W

FWD thermal model values

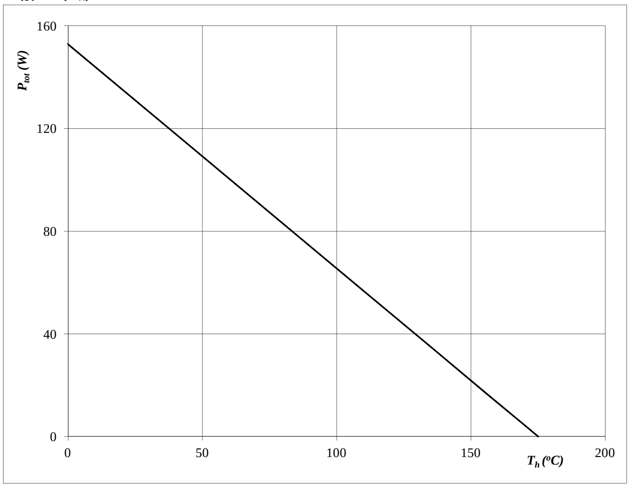
R (C/W)	Tau (s)
0,06	4,8E+00
0,17	7,6E-01
0,70	1,6E-01
0,53	5,1E-02
0,19	1,1E-02
0,12	1,6E-03

H-Bridge

Figure 21 IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



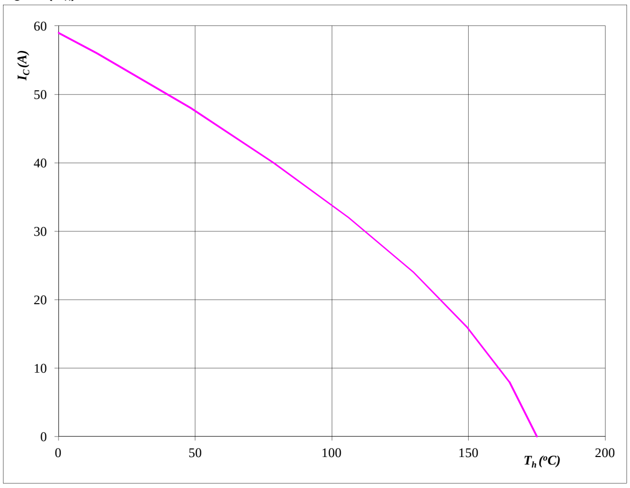
At

T_j = 175 ℃

Figure 22 IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

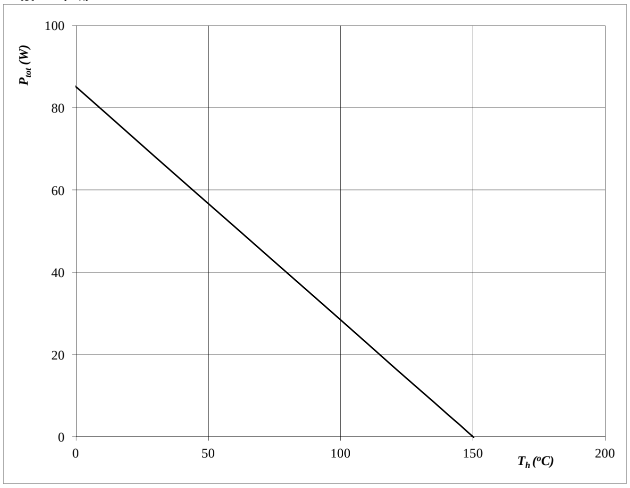
T_j = 175 ℃

V_{GE} = 15 V

Figure 23 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



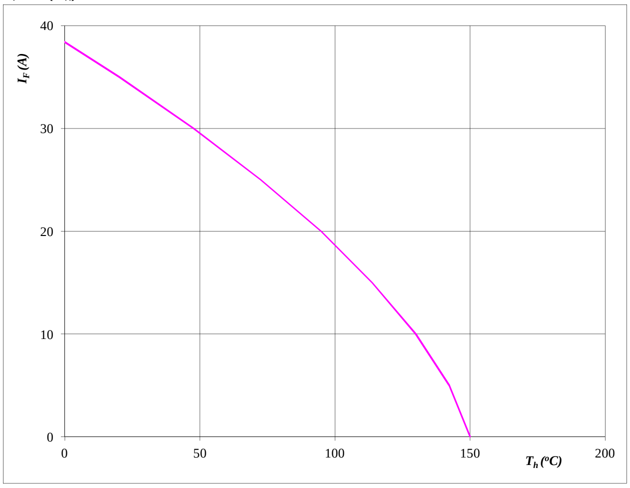
At

T_j = 150 ℃

Figure 24 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

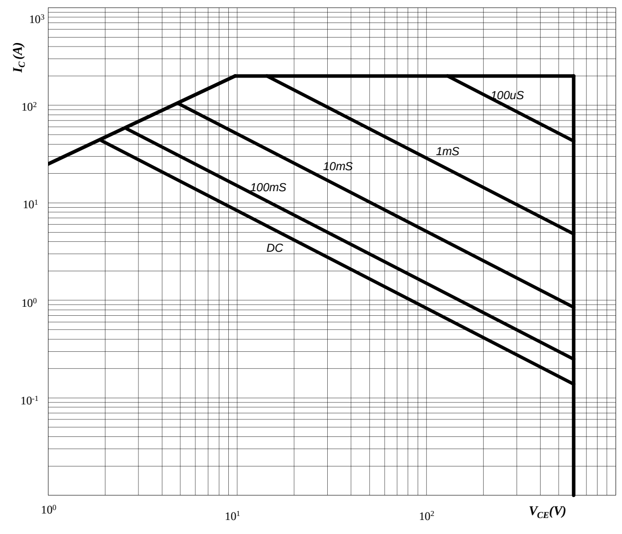
T_j = 150 ℃

H-Bridge

Figure 25 IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



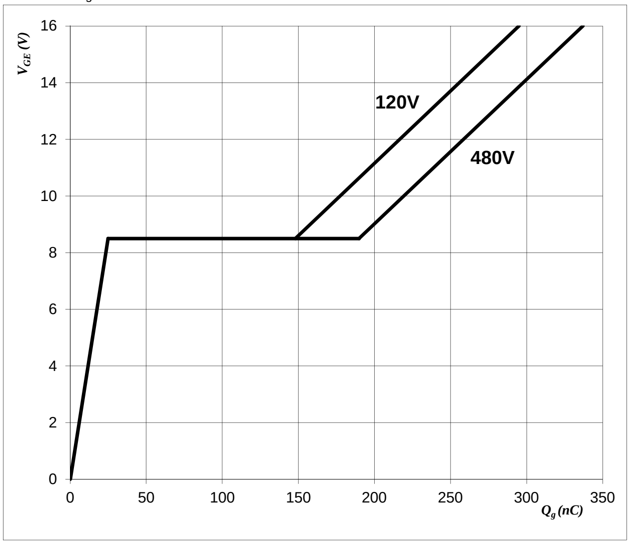
At

D =	single pulse	
Th =	80	ºC
V_{GE} =	15	V
T_j =	T_{jmax}	ºC

Figure 26 IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



At

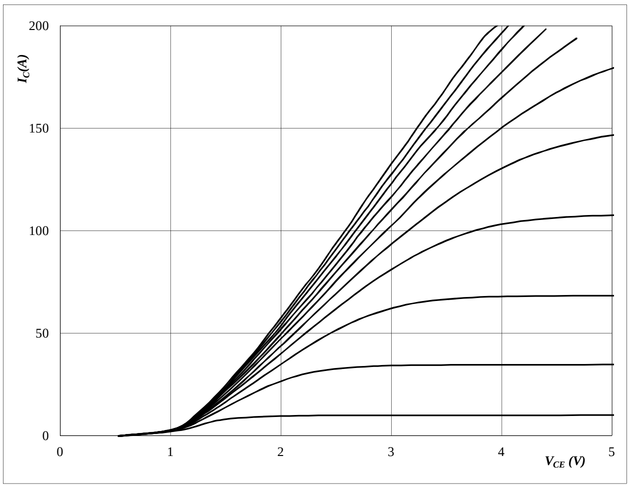
I_C =	50	A

INPUT BOOST

Figure 1 BOOST IGBT

Typical output characteristics

$I_D = f(V_{DS})$



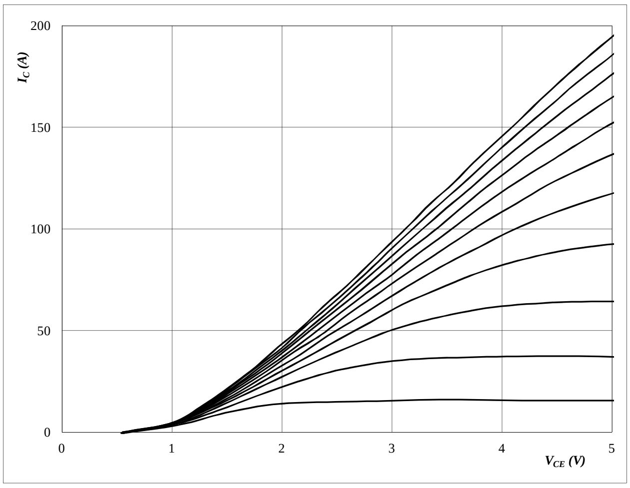
At

t_p =	250	ľ s
T_j =	25	℃
V_{GS} from	7 V to 17 V in steps of 1 V	

Figure 2 BOOST IGBT

Typical output characteristics

$I_D = f(V_{DS})$



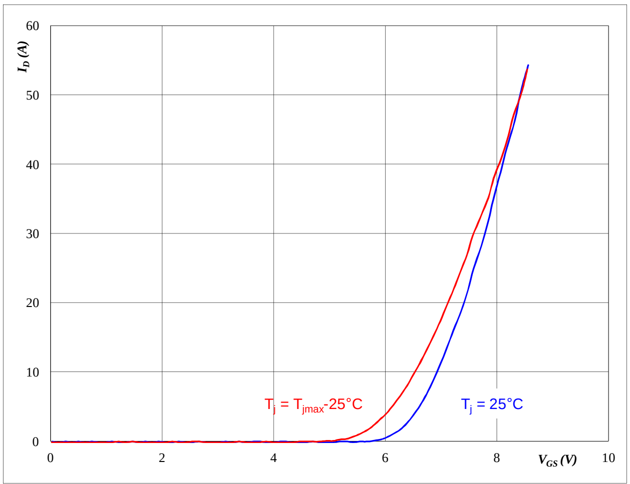
At

t_p =	250	ľ s
T_j =	125	℃
V_{GS} from	7 V to 17 V in steps of 1 V	

Figure 3 BOOST IGBT

Typical transfer characteristics

$I_D = f(V_{GS})$



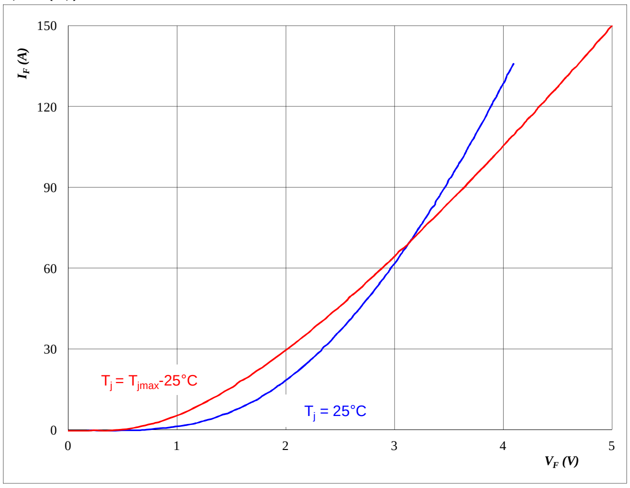
At

t_p =	250	ľ s
V_{DS} =	10	V

Figure 4 BOOST FWD

Typical diode forward current as
a function of forward voltage

$I_F = f(V_F)$



At

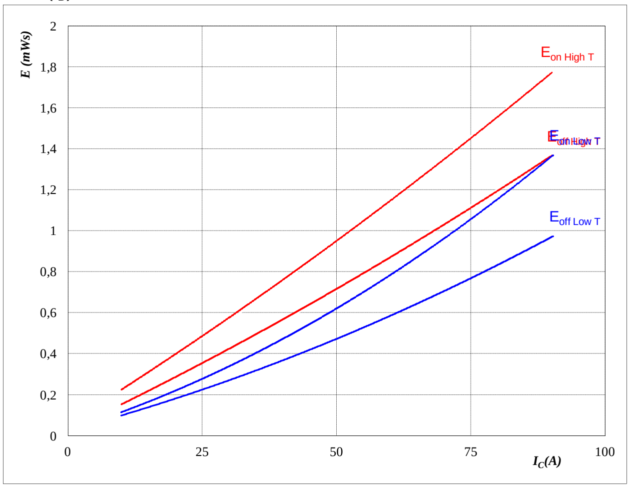
t_p =	250	ľ s

INPUT BOOST

Figure 5 BOOST IGBT

Typical switching energy losses
as a function of collector current

E = f(I_D)



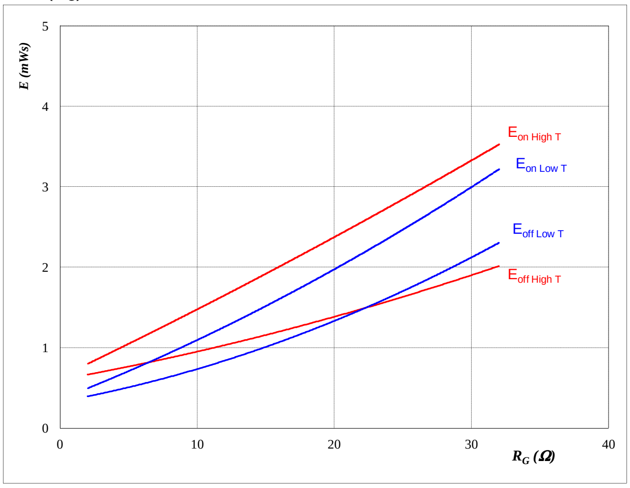
With an inductive load at

T_j =	25/125	℃
V_{DS} =	400	V
V_{GS} =	15	V
R_{gon} =	4	Ŏ
R_{goff} =	4	Ŏ

Figure 6 BOOST IGBT

Typical switching energy losses
as a function of gate resistor

E = f(R_G)



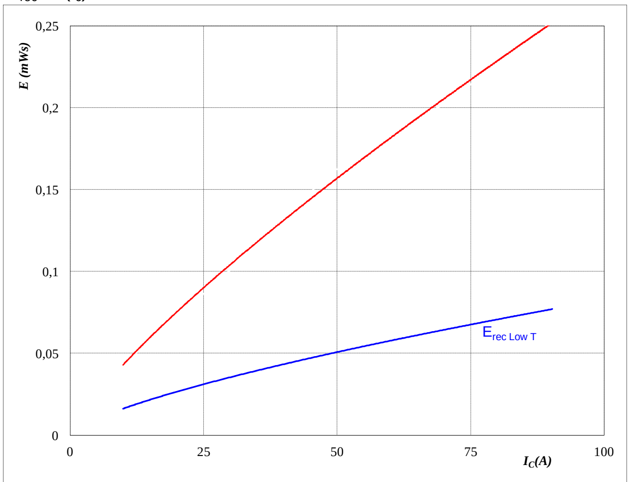
With an inductive load at

T_j =	25/125	℃
V_{DS} =	400	V
V_{GS} =	15	V
I_D =	50	A

Figure 7 BOOST FWD

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

E_{rec} = f(I_c)



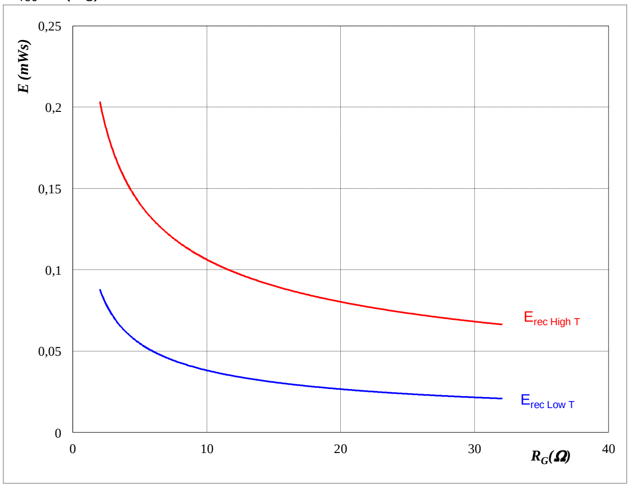
With an inductive load at

T_j =	25/125	℃
V_{DS} =	400	V
V_{GS} =	15	V
R_{gon} =	4	Ŏ
R_{goff} =	4	Ŏ

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

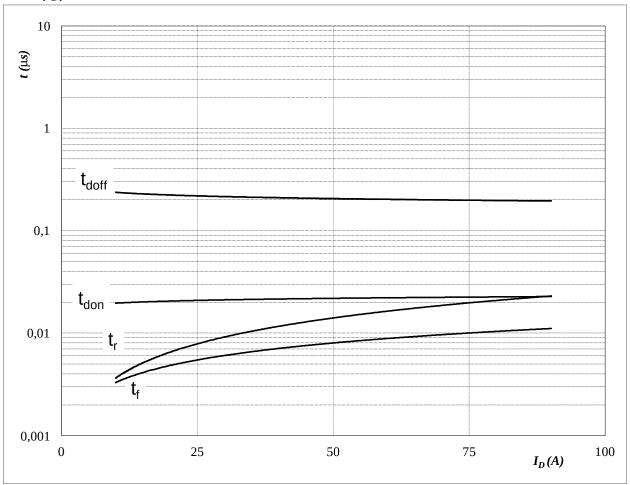
T_j =	25/125	℃
V_{DS} =	400	V
V_{GS} =	15	V
I_D =	50	A

INPUT BOOST

Figure 9 BOOST IGBT

Typical switching times as a function of collector current

t = f(I_D)



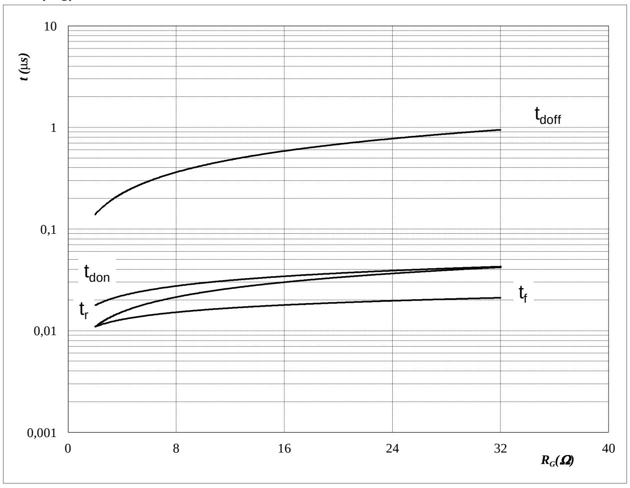
With an inductive load at

T_j =	125	℃
V_{DS} =	400	V
V_{GS} =	15	V
R_{gon} =	4	Ǒ
R_{goff} =	4	Ǒ

Figure 10 BOOST IGBT

Typical switching times as a function of gate resistor

t = f(R_G)



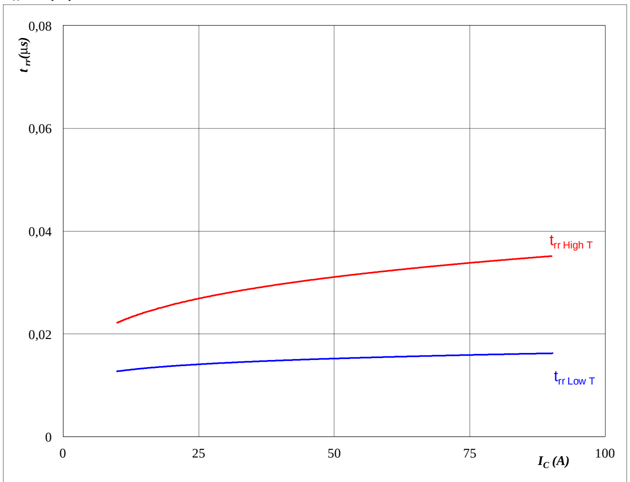
With an inductive load at

T_j =	125	℃
V_{DS} =	400	V
V_{GS} =	15	V
I_C =	50	A

Figure 11 BOOST FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



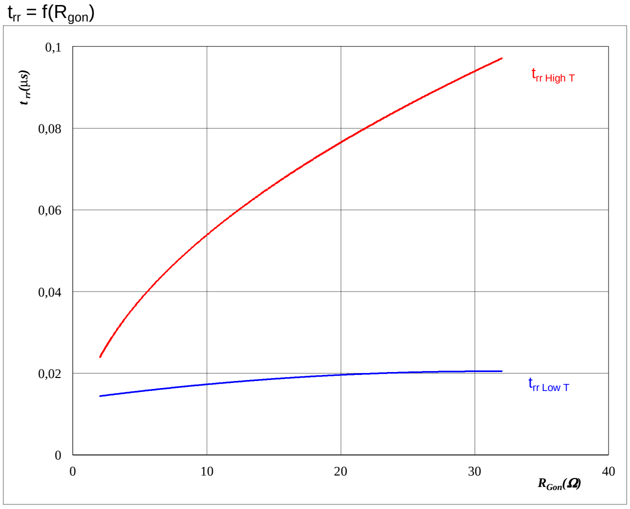
At

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ǒ

Figure 12 BOOST FWD

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

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



At

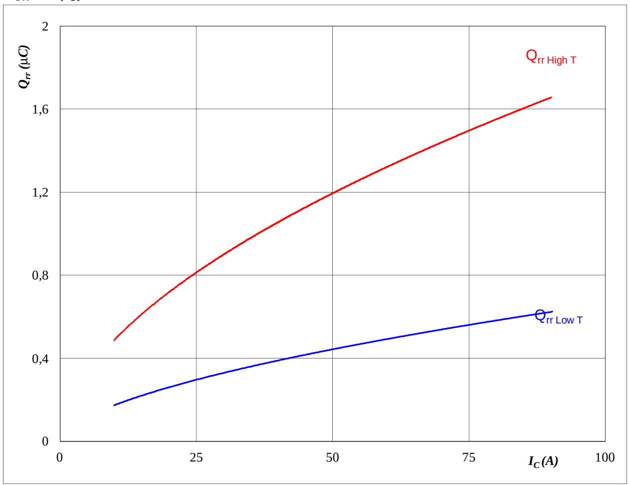
T_j =	25/125	℃
V_R =	400	V
I_F =	50	A
V_{GS} =	15	V

INPUT BOOST

Figure 13 BOOST FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



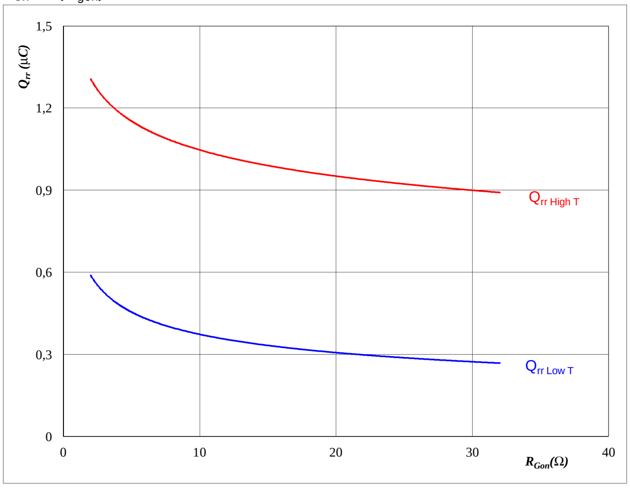
At

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ŏ

Figure 14 BOOST FWD

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

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



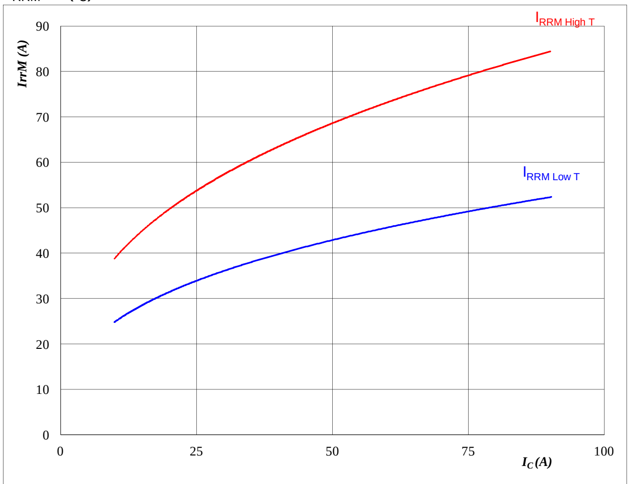
At

Tj =	25/125	℃
V_R =	400	V
I_F =	50	A
V_{GS} =	15	V

Figure 15 BOOST FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



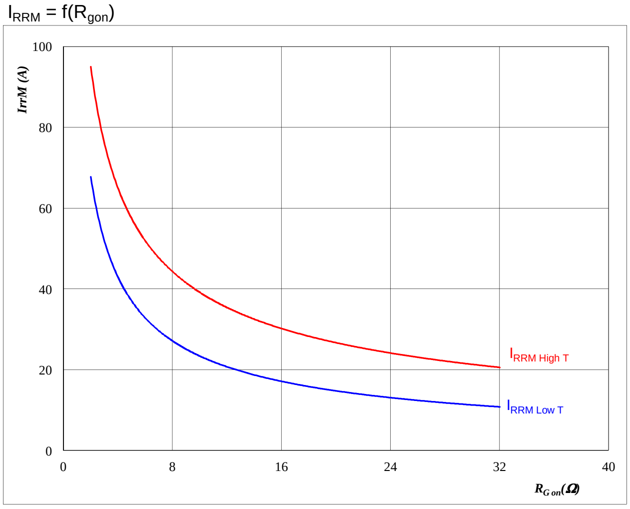
At

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ŏ

Figure 16 BOOST FWD

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

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



At

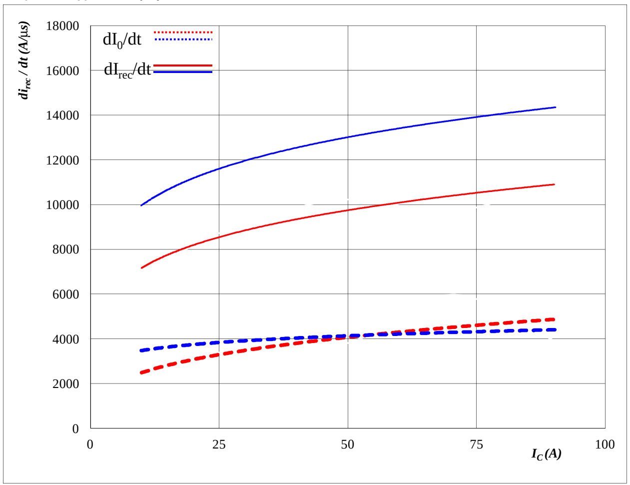
T_j =	25/125	℃
V_R =	400	V
I_F =	50	A
V_{GS} =	15	V

INPUT BOOST

Figure 17 BOOST FWD

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

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



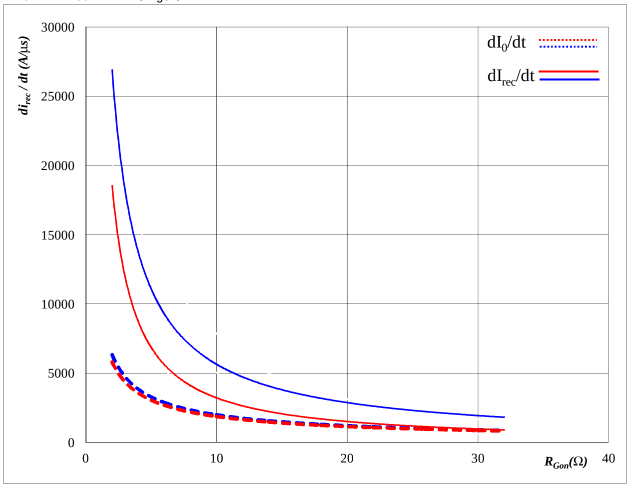
At

T_j =	25/125	℃
V_{CE} =	400	V
V_{GE} =	15	V
R_{gon} =	4	Ŏ

Figure 18 BOOST FWD

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

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



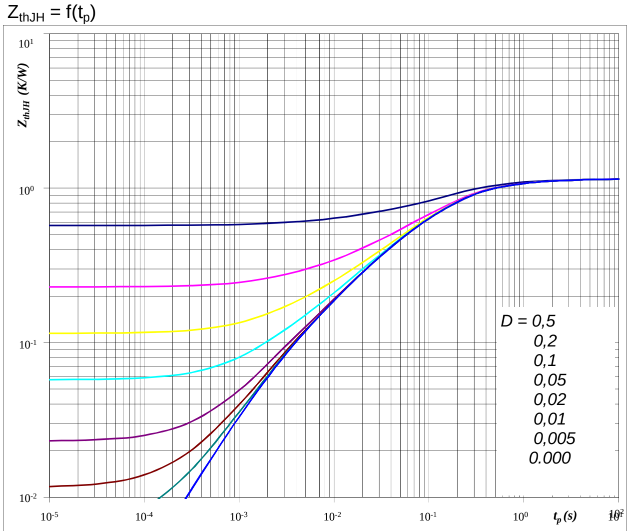
At

Tj =	25/125	℃
VR =	400	V
IF =	50	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} =	1,15	K/W

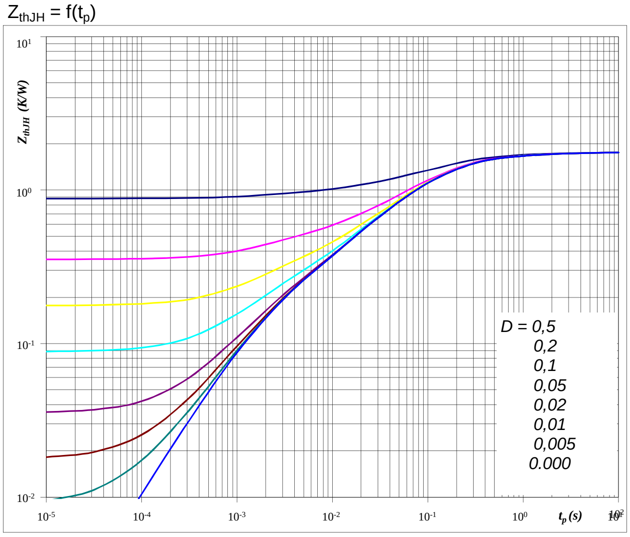
IGBT thermal model values

R (C/W)	Tau (s)
9,49E-02	2,03E+00
3,34E-01	3,24E-01
5,08E-01	9,38E-02
1,62E-01	1,49E-02
4,63E-02	2,34E-03
0,00E+00	0,00E+00

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} =	1,76	K/W

FWD thermal model values

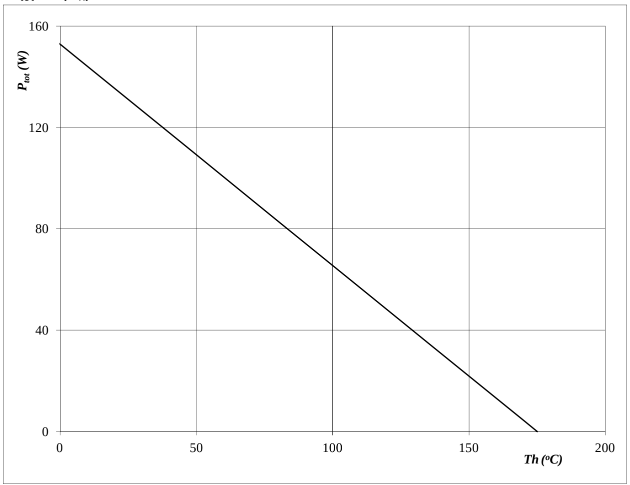
R (C/W)	Tau (s)
5,96E-02	4,76E+00
1,66E-01	7,60E-01
6,99E-01	1,60E-01
5,26E-01	5,15E-02
1,89E-01	1,12E-02
1,23E-01	1,64E-03

INPUT BOOST

Figure 21 BOOST IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



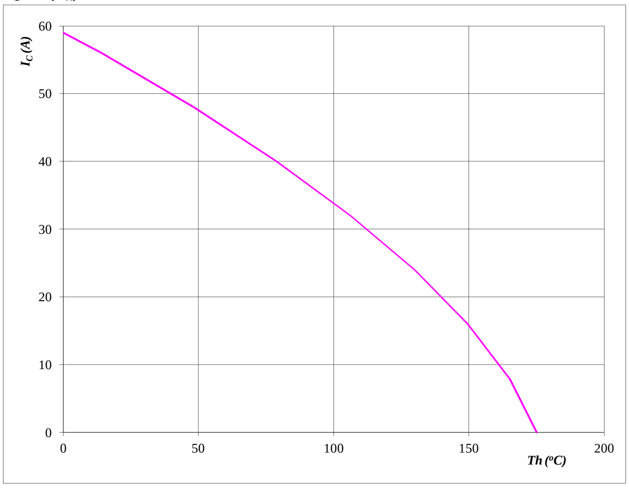
At

T_j = 175 ºC

Figure 22 BOOST IGBT

Collector/Drain current as a function of heatsink temperature

$I_C = f(T_h)$



At

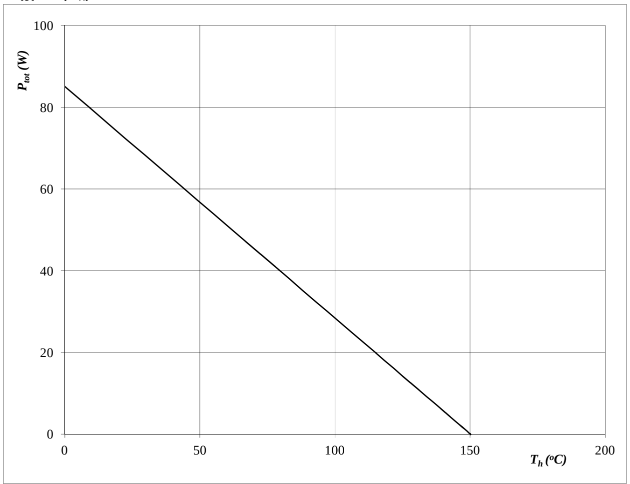
T_j = 175 ºC

V_{GS} = 15 V

Figure 23 BOOST FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



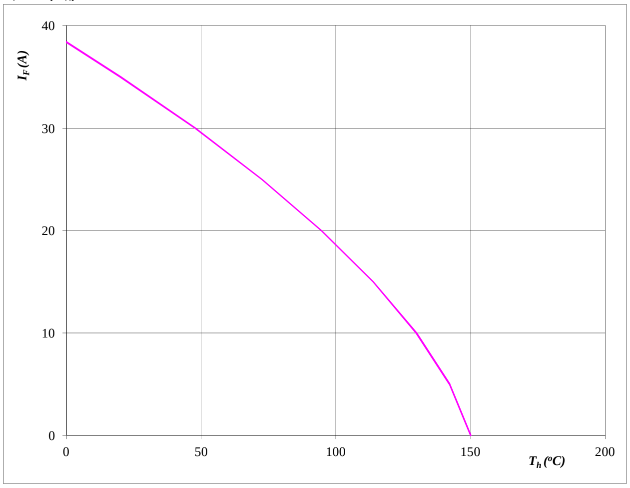
At

T_j = 150 ºC

Figure 24 BOOST FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

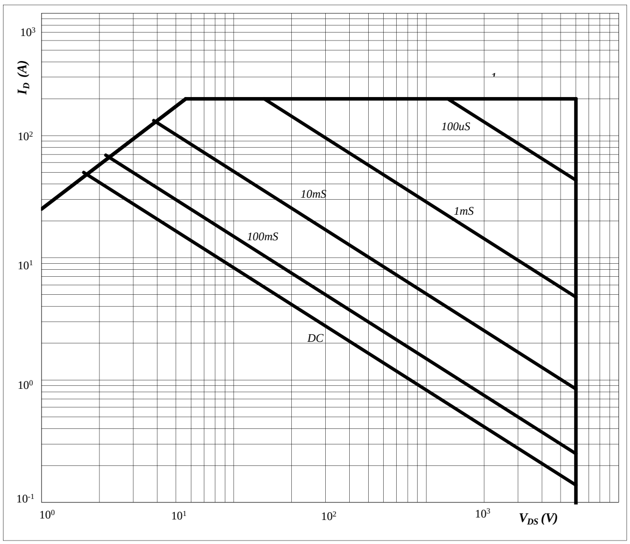
T_j = 150 ºC

INPUT BOOST

Figure 25	BOOST IGBT

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



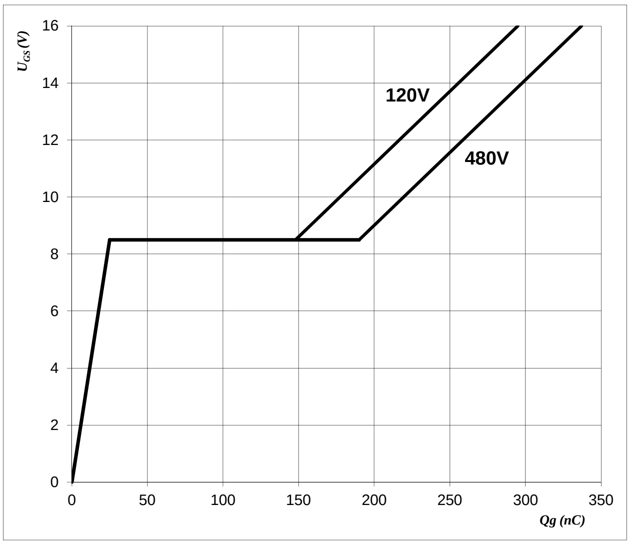
At

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

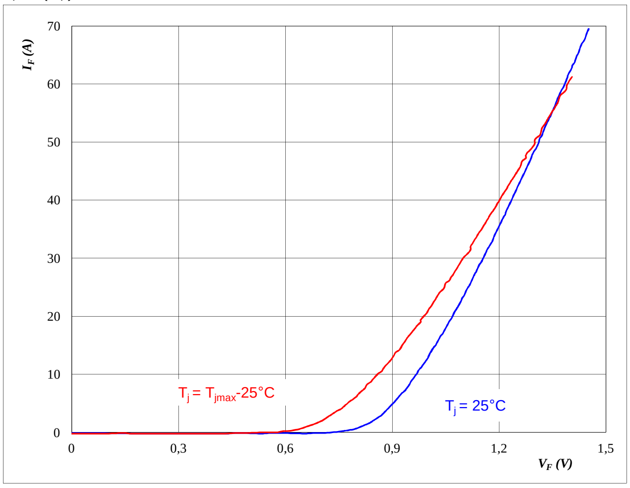
I_D =	50	A

Bypass Diode

Figure 1 Bypass diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



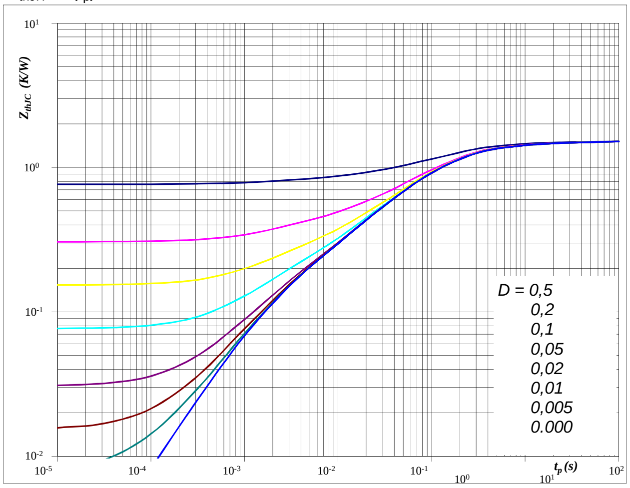
At

t_p = 250 μs

Figure 2 Bypass diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

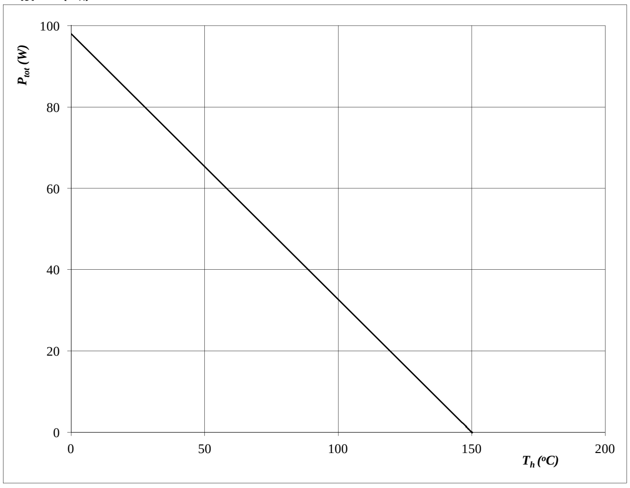
D = t_p / T

R_{thJH} = 1,528 K/W

Figure 3 Bypass diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



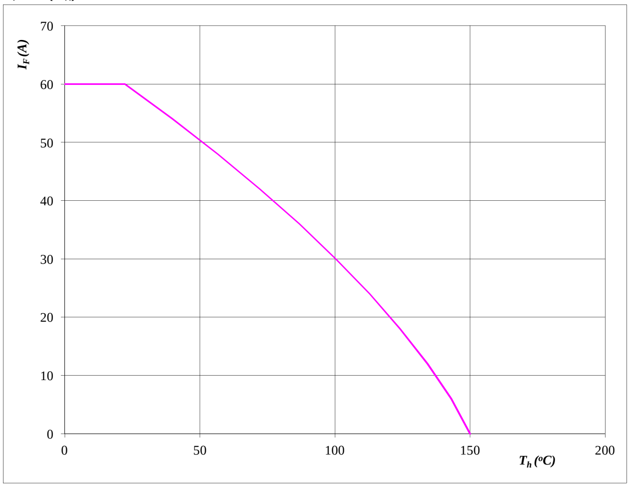
At

T_j = 150 ºC

Figure 4 Bypass diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

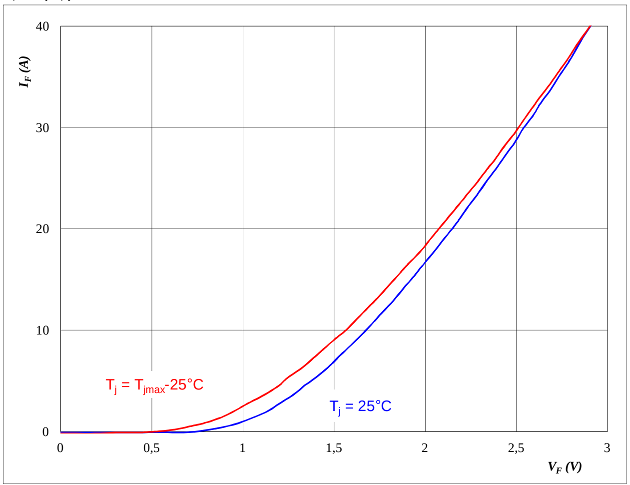
T_j = 150 ºC

INP. BOOST INVERSE DIODE

Figure 1 INP. BOOST INVERSE DIODE

Typical thyristor forward current as a function of forward voltage

$I_F = f(V_F)$



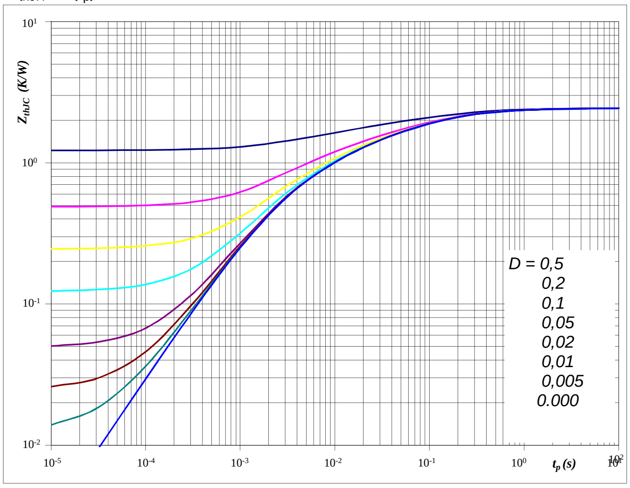
At

t_p =	250	ř s

Figure 2 INP. BOOST INVERSE DIODE

Thyristor transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



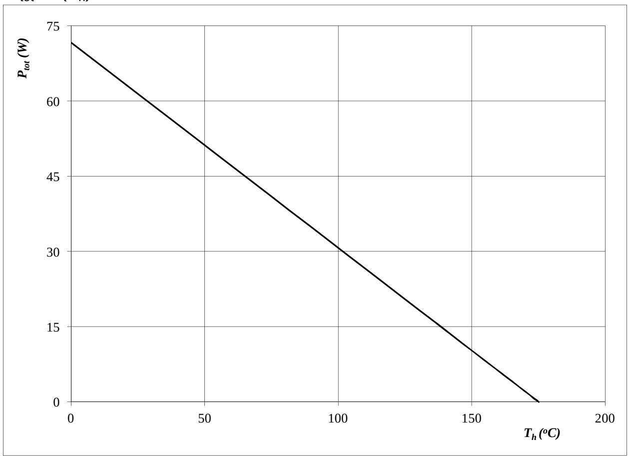
At

D =	t_p / T	
R_{thJH} =	2,44	K/W

Figure 3 INP. BOOST INVERSE DIODE

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



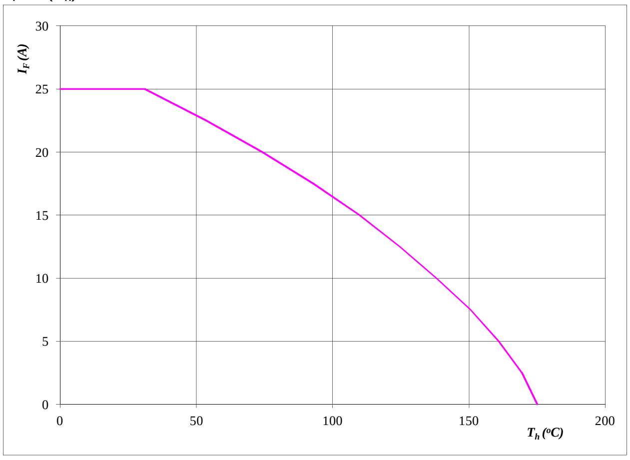
At

T_j =	175	ºC

Figure 4 INP. BOOST INVERSE DIODE

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



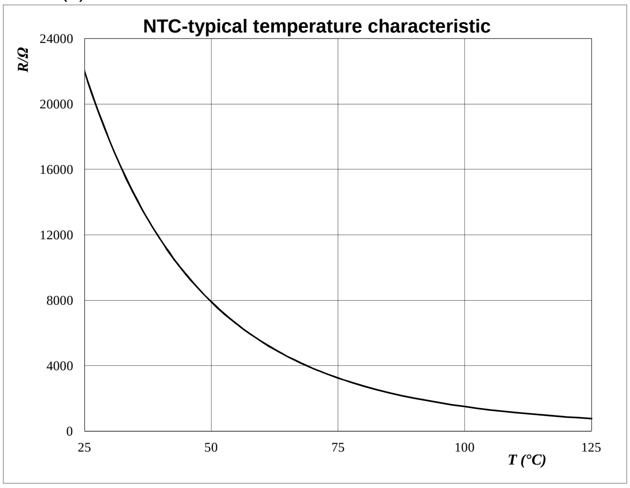
At

T_j =	175	ºC

Thermistor

Figure 1	Thermistor

Typical NTC characteristic
as a function of temperature
$R_T = f(T)$



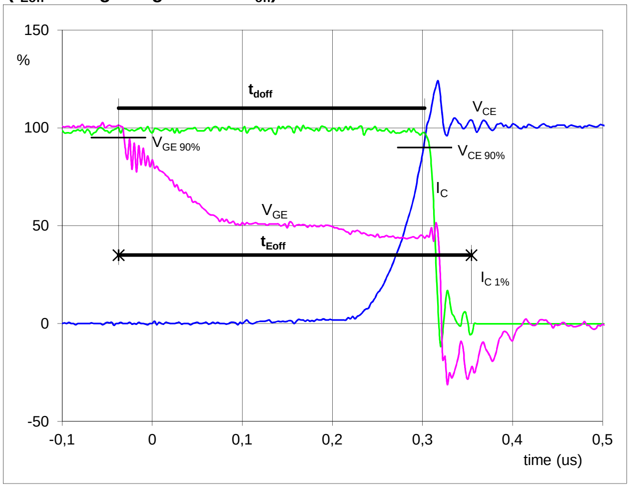
Switching Definitions H-Bridge IGBT

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

Figure 1 H-Bridge IGBT

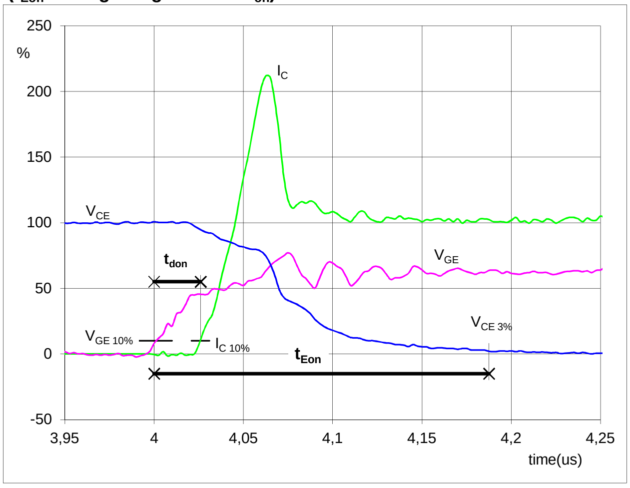
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	400	V
I_C (100%) =	50	A
t_{doff} =	0,33	ľ s
t_{Eoff} =	0,39	ľ s

Figure 2 H-Bridge IGBT

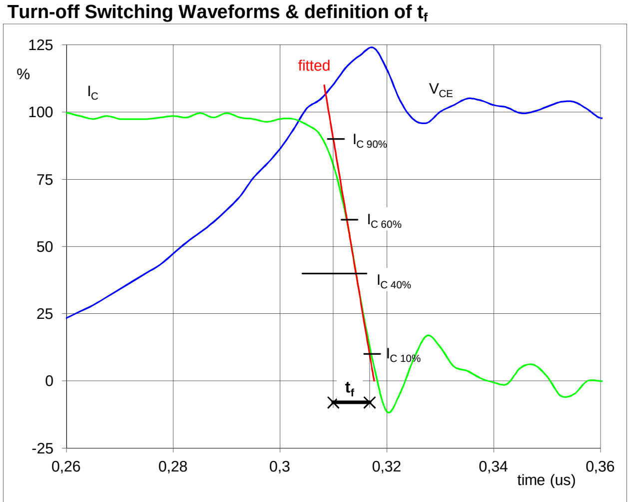
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	15	V
V_C (100%) =	400	V
I_C (100%) =	50	A
t_{don} =	0,03	ľ s
t_{Eon} =	0,19	ľ s

Figure 3 H-Bridge IGBT

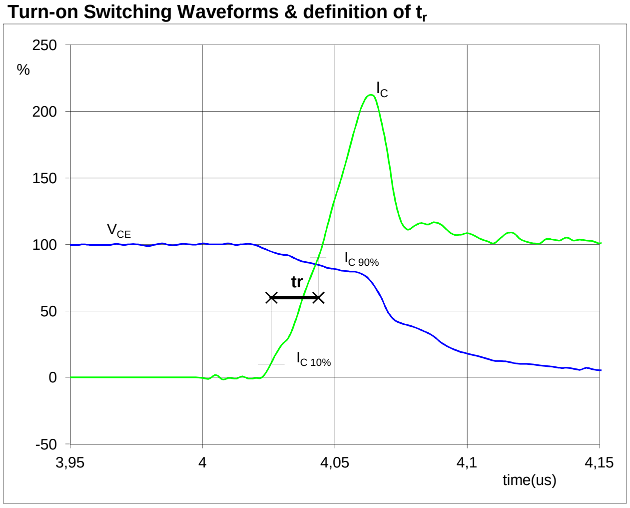
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	400	V
I_C (100%) =	50	A
t_f =	0,01	ľ s

Figure 4 H-Bridge IGBT

Turn-on Switching Waveforms & definition of t_r

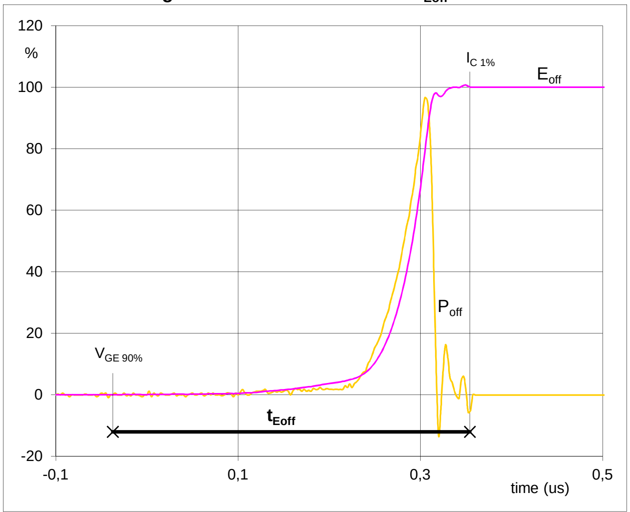


V_C (100%) =	400	V
I_C (100%) =	50	A
t_r =	0,02	ľ s

Switching Definitions H-Bridge IGBT

Figure 5 H-Bridge IGBT

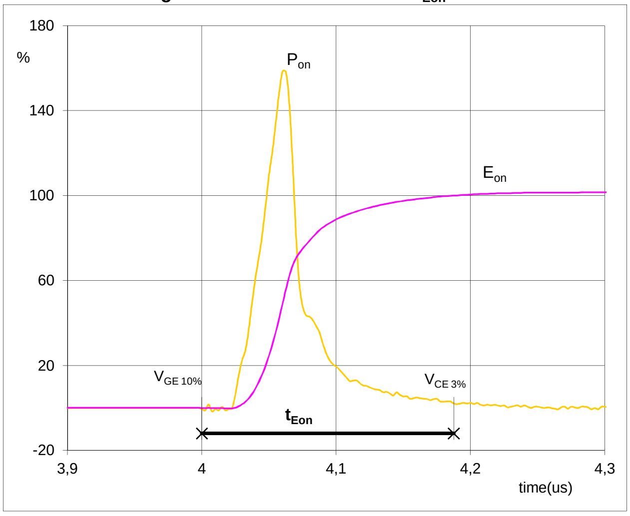
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	19,99	kW
E_{off} (100%) =	0,80	mJ
t_{Eoff} =	0,39	ř s

Figure 6 H-Bridge IGBT

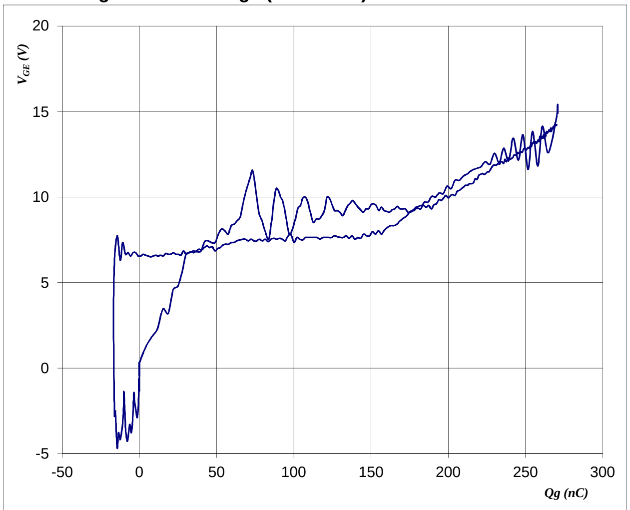
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	19,99	kW
E_{on} (100%) =	1,20	mJ
t_{Eon} =	0,19	ř s

Figure 7 H-Bridge IGBT

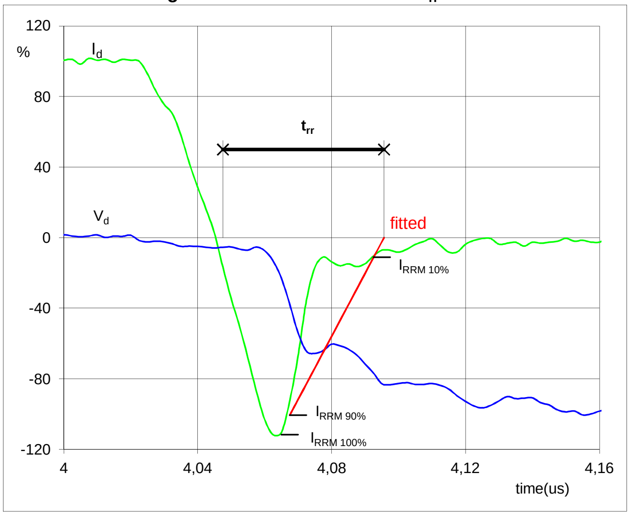
Gate voltage vs Gate charge (measured)



V_{GEoff} =	0	V
V_{GEon} =	15	V
V_C (100%) =	400	V
I_C (100%) =	50	A
Q_g =	270,72	nC

Figure 8 H-Bridge FWD

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

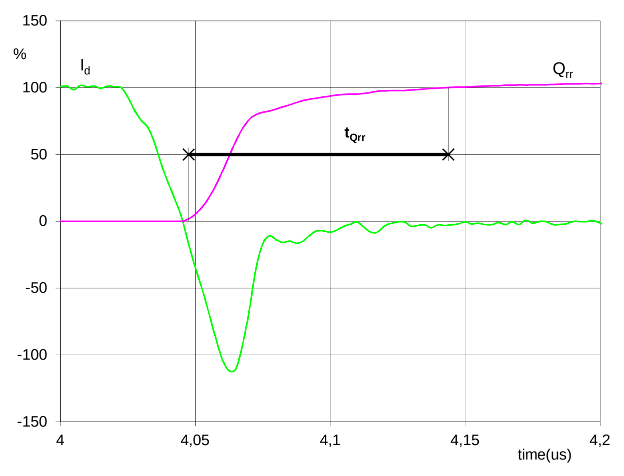


V_d (100%) =	400	V
I_d (100%) =	50	A
I_{RRM} (100%) =	-56	A
t_{rr} =	0,03	ř s

Switching Definitions H-Bridge IGBT

Figure 9 H-Bridge FWD

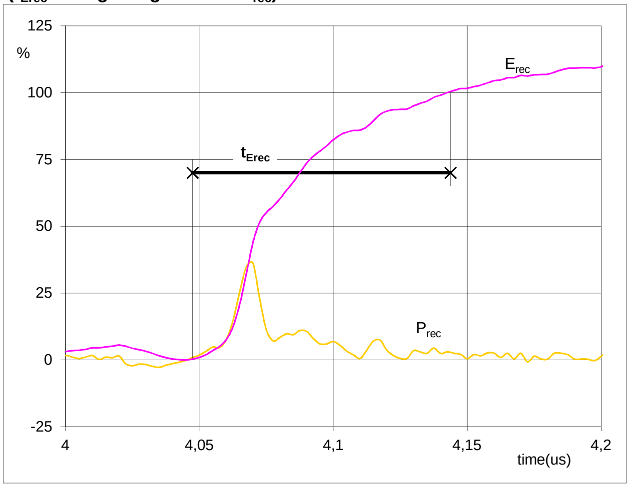
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	50	A
Q_{rr} (100%) =	1,16	ř C
t_{Qrr} =	0,10	ř s

Figure 10 H-Bridge FWD

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



P_{rec} (100%) =	19,99	kW
E_{rec} (100%) =	0,13	mJ
t_{Erec} =	0,10	ř s

Ordering Code and Marking - Outline - Pinout

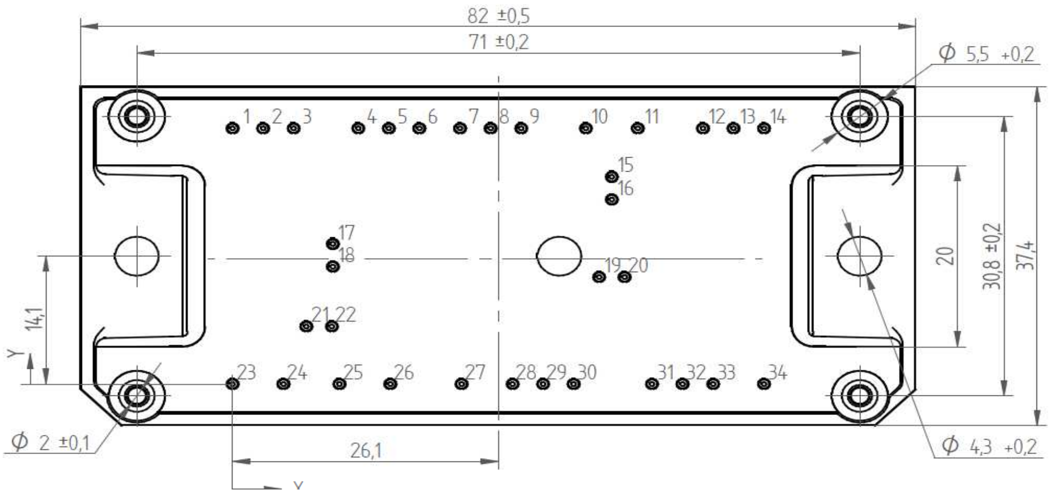
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FY06BIA050SG-M523E18	M523E18	M523E18

Outline

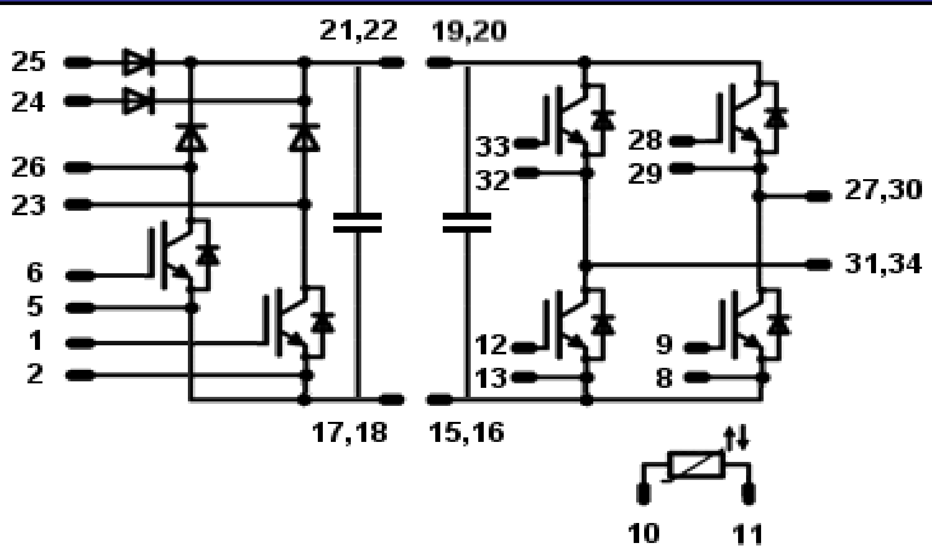
Pin table		
Pin	X	Y
1	0	28,2
2	3	28,2
3	6	28,2
4	12,35	28,2
5	15,35	28,2
6	18,35	28,2
7	22,35	28,2
8	25,35	28,2
9	28,35	28,2
10	34,7	28,2
11	39,8	28,2
12	46,2	28,2
13	49,2	28,2
14	52,2	28,2
15	37,25	22,85
16	37,25	20,35
17	9,85	15,45
18	9,85	12,95
19	36	11,8
20	38,5	11,8
21	7,25	6,35
22	9,75	6,35
23	0	0
24	5	0
25	10,5	0
26	15,5	0
27	22,5	0
28	27,5	0
29	30,5	0
30	33,5	0

Pin table		
Pin	X	Y
31	41,2	0
32	44,2	0
33	47,2	0
34	52,2	0



Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance
PCB cutouts and holes see in handling instructions document

Pinout



Pins 3,4,7,14 are not connected.
Pins 27 and 30 have to be connected together
Pins 31 and 34 have to be connected together

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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