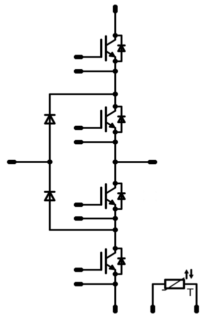
flowNPC 2 — 600V/200A

Features
- Neutral-point-Clamped inverter
- High power flow2 housing
- High Speed IGBT3 in Buck
- Low Inductance Layout

flow2 housing


Target Applications
- UPS
- Solar inverters

Schematic


Types
- F206NIA200SG

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Buck 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℃	143 188	A
Repetitive peak collector current	I_{Cpulse}	t_p limited by $T_j$max		800	A
Power dissipation	P_{tot}	$T_j=T_j$max	T_h=80℃ T_c=80℃	286 433	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	℃
Buck FWD					
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℃	96 129	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max	T_c=100℃	240	A
Power dissipation	P_{tot}	$T_j=T_j$max	T_h=80℃ T_c=80℃	141 175	W
Maximum Junction Temperature	$T_j$max			175	℃

Maximum Ratings

Tj=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
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℃	151 198	A
Repetitive peak collector current	I_{Cpuls}	t_p limited by $T_j$max		600	A
Power dissipation	P_{tot}	$T_j=T_j$max	T_h=80℃ T_c=80℃	245 372	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	℃
Boost Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_c=25℃		1200	V
DC forward current	I_F	$T_j=T_j$max	T_h=80℃ T_c=80℃	134 178	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		600	A
Power dissipation per Diode	P_{tot}	$T_j=T_j$max	T_h=80℃ T_c=80℃	195 295	W
Maximum Junction Temperature	$T_j$max			175	℃
Boost FWD					
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℃	134 178	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		600	A
Power dissipation	P_{tot}	$T_j=T_j$max	T_h=80℃ T_c=80℃	195 295	W
Maximum Junction Temperature	$T_j$max			175	℃
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
Buck IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	VCE=VGE			0,0008	Tj=25℃ Tj=150℃	4,1	5,1	5,7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	Tj=25℃ Tj=150℃		1,88 2,17	2,3	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		Tj=25℃ Tj=150℃			0,7	µA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25℃ Tj=150℃			960	µA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ω Rgon=4 Ω	±15	350	200	Tj=25℃ Tj=150℃		200 200		ns
Rise time	t_r					Tj=25℃ Tj=150℃		43 46		
Turn-off delay time	$t_{d(off)}$					Tj=25℃ Tj=150℃		248 270		
Fall time	t_f					Tj=25℃ Tj=150℃		16 20		
Turn-on energy loss per pulse	E_{on}					Tj=25℃ Tj=150℃		2,67 3,48		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25℃ Tj=150℃		2,64 3,38		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25℃		11840		pF
Output capacitance	C_{oss}							464		
Reverse transfer capacitance	C_{rss}							384		
Gate charge	Q_{Gate}		15	700	200	Tj=25℃		2000		nC
Thermal resistance chip to heatsink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,33		K/W
Thermal resistance chip to case	R_{thJC}							0,22		
Buck FWD										
Diode forward voltage	V_F				120	Tj=25℃ Tj=150℃		2,59 2,23		V
Peak reverse recovery current	I_{RRM}	Rgoff=4 Ω	0	350	200	Tj=25℃ Tj=150℃		99 154		A
Reverse recovery time	t_{rr}					Tj=25℃ Tj=150℃		42 111		ns
Reverse recovered charge	Q_{rr}					Tj=25℃ Tj=150℃		2,6 7,3		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25℃ Tj=150℃		8553 3995		A/µs
Reverse recovered energy	Erec					Tj=25℃ Tj=150℃		0,47 1,54		mWs
Thermal resistance chip to heatsink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,67		K/W
Thermal resistance chip to case	R_{thJC}							0,44		

Characteristic Values

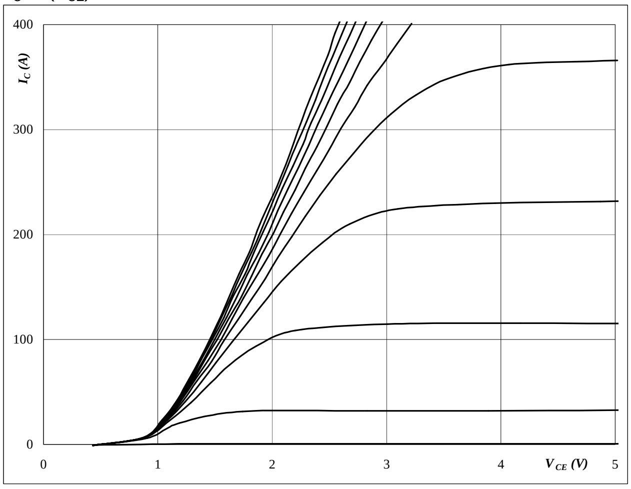
Parameter	Symbol	Conditions	V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	Unit
Boost IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0032	Tj=25°C Tj=125°C	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		200	Tj=25°C Tj=150°C	1,05	1,53 1,72	1,85	V
Collector-emitter cut-off incl diode	I_{CES}		0	600		Tj=25°C Tj=150°C			0,96	mA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=150°C			700	nA
Integrated Gate resistor	R_{gint}							1		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=4 Ω Rgon=4 Ω	±15	350	200	Tj=25°C Tj=150°C		233 238		ns
Rise time	t_r					Tj=25°C Tj=150°C		43 47		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=150°C		309 334		
Fall time	t_f					Tj=25°C Tj=150°C		68 90		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=150°C		3,90 4,76		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=150°C		6,02 7,98		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		12320		pF
Output capacitance	C_{oss}							768		
Reverse transfer capacitance	C_{rss}							366		
Gate charge	Q_{Gate}		15	480	200	Tj=25°C		2100		nC
Thermal resistance chip to heatsink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,39		K/W
Thermal resistance chip to case	R_{thJC}							0,26		
Boost Inverse Diode										
Diode forward voltage	V_F				20	Tj=25°C Tj=125°C		1,67 1,72		V
Thermal resistance chip to heatsink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,49		K/W
Thermal resistance chip to case	R_{thJC}							0,32		
Boost FWD										
Diode forward voltage	V_F				200	Tj=25°C Tj=150°C	1,5	1,66 1,72	3,3	V
Reverse leakage current	I_r			600		Tj=25°C Tj=150°C			600	µA
Peak reverse recovery current	I_{RRM}	Rgoff=4 Ω	±15	350	200	Tj=25°C Tj=150°C		131 168		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=150°C		136 285		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=150°C		9,0 16,9		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=150°C		2729 1706		A/µs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=150°C		2,18 4,38		mWs
Thermal resistance chip to heatsink	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0,49		K/W
Thermal resistance chip to case	R_{thJC}							0,32		
Thermistor										
Rated resistance	R					T=25°C		22000		Ω
Deviation of R100	ΔR/R	R100=1486 Ω				T=100°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		3996		K
Vincotech NTC Reference									B	

Buck

Figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



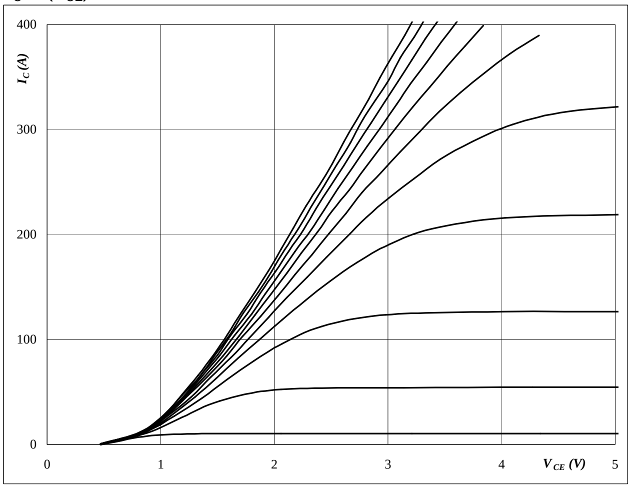
At

t_p =	250	µs
T_j =	25	℃
V_{GE} from	6 V to 16 V in steps of 1 V	

Figure 2 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



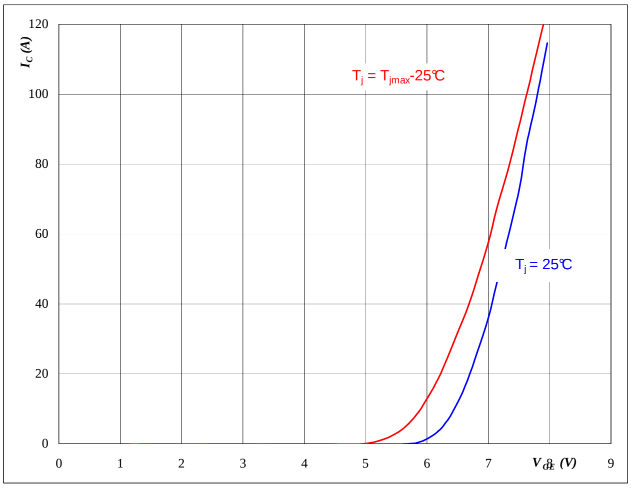
At

t_p =	250	µs
T_j =	125	℃
V_{GE} from	6 V to 16 V in steps of 1 V	

Figure 3 IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



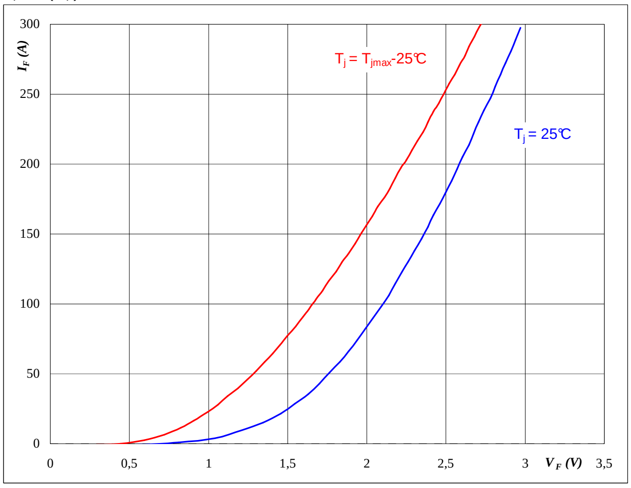
At

t_p =	250	µs
V_{CE} =	10	V

Figure 4 Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

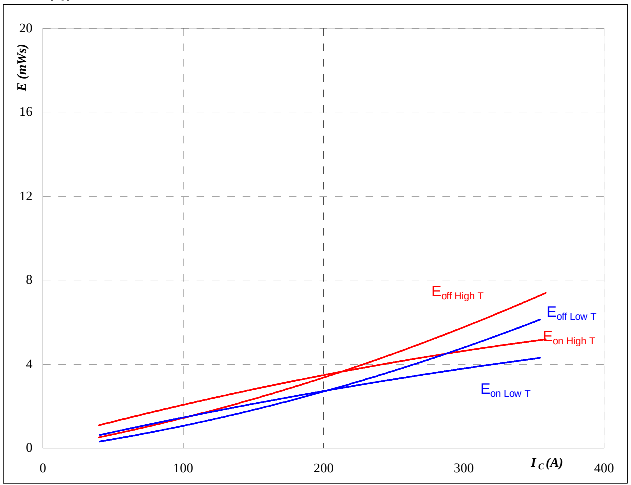
t_p =	250	µs

Buck

Figure 5 IGBT

Typical switching energy losses as a function of collector current

E = f(I_C)



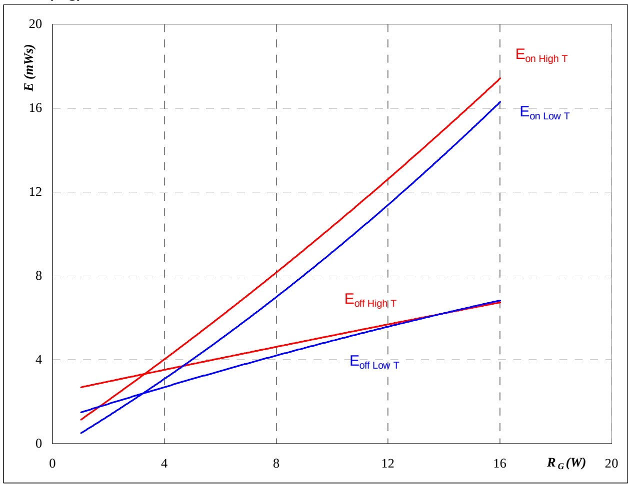
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±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)



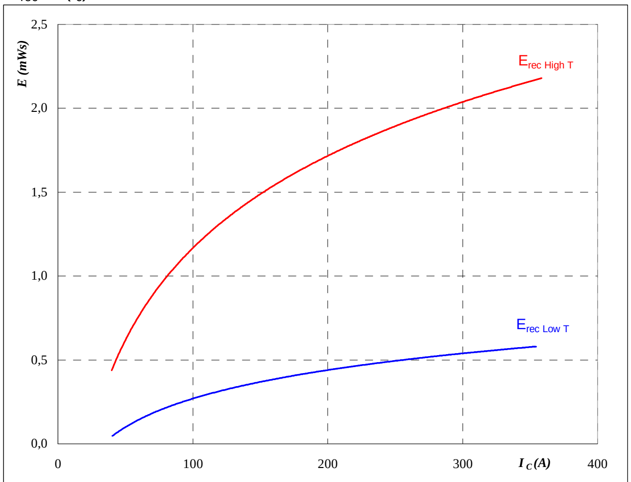
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	200	A

Figure 7 Diode

Typical reverse recovery energy loss as a function of collector current

E_{rec} = f(I_c)



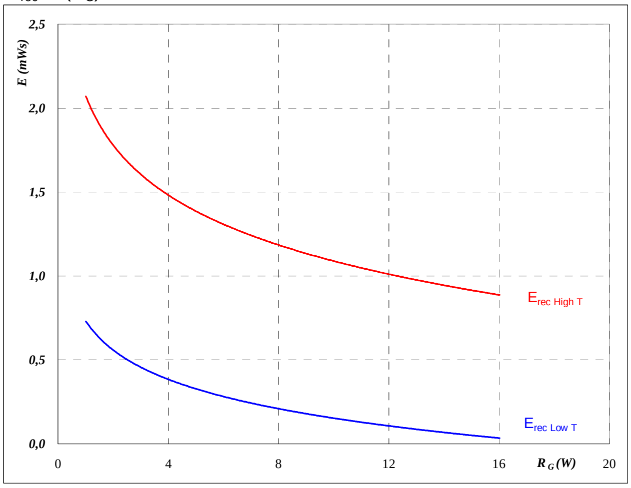
With an inductive load at

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

Figure 8 Diode

Typical reverse recovery energy loss as a function of gate resistor

E_{rec} = f(R_G)



With an inductive load at

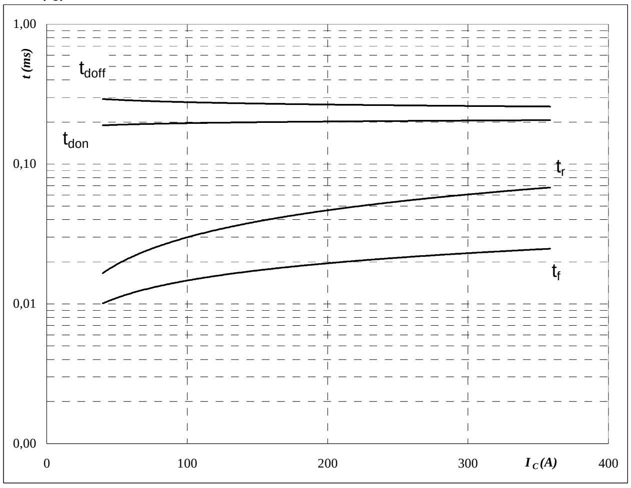
T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	200	A

Buck

Figure 9 IGBT

Typical switching times as a function of collector current

t = f(I_C)



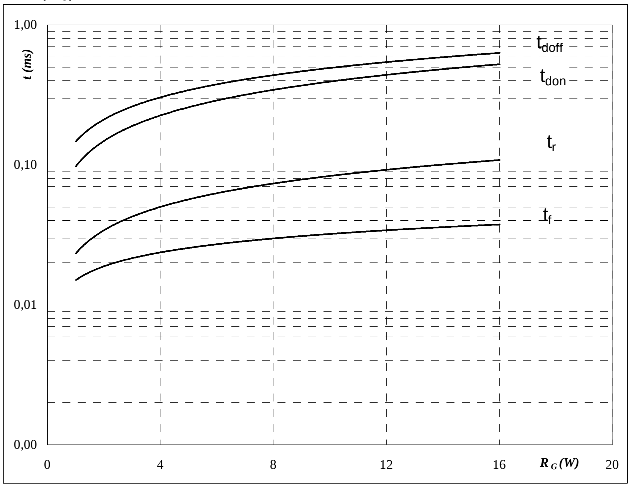
With an inductive load at

T_j =	125	℃
V_{CE} =	350	V
V_{GE} =	±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)



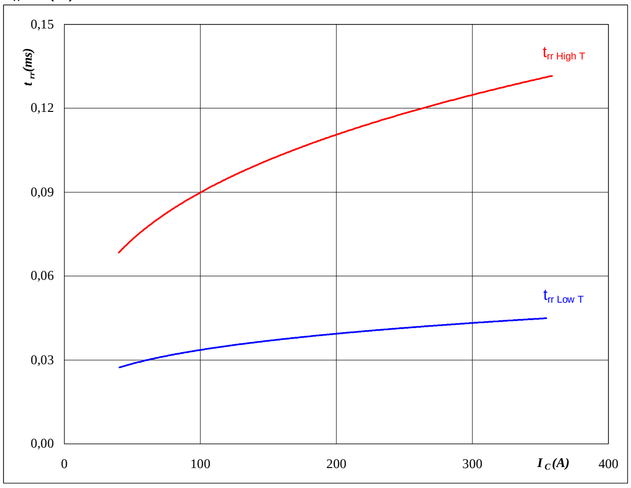
With an inductive load at

T_j =	125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	200	A

Figure 11 Diode

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



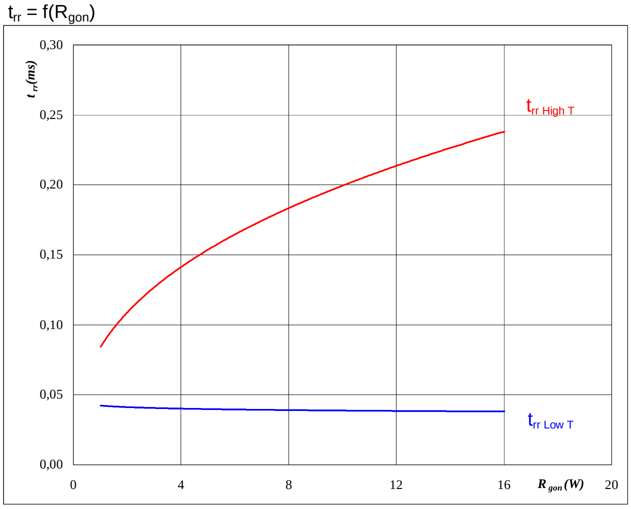
At

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

Figure 12 Diode

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

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



At

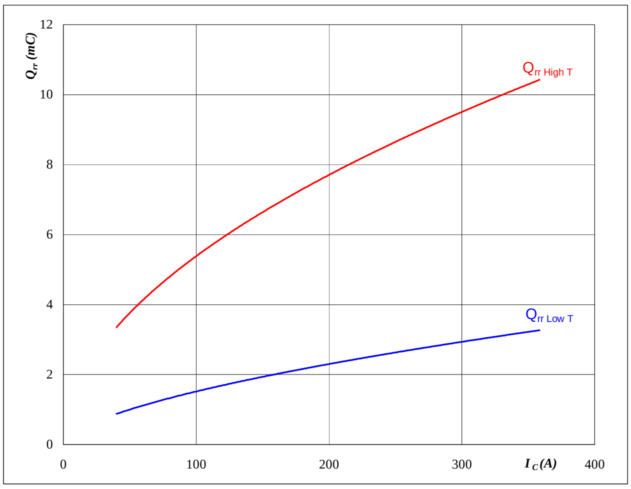
T_j =	25/125	℃
V_R =	350	V
I_F =	200	A
V_{GE} =	±15	V

Buck

Figure 13 Diode

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



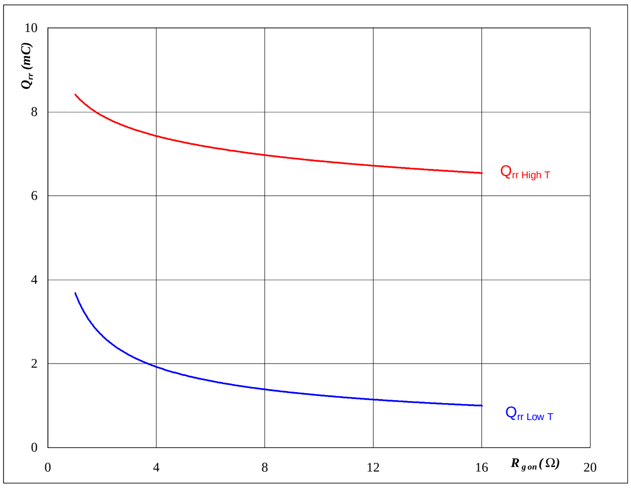
At

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

Figure 14 Diode

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

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



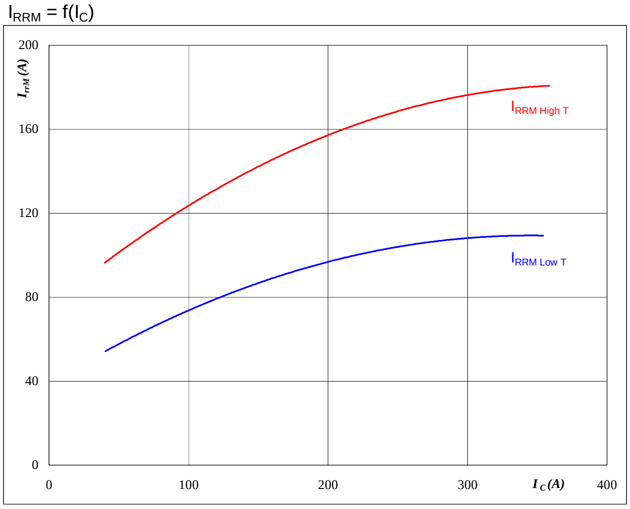
At

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

Figure 15 Diode

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



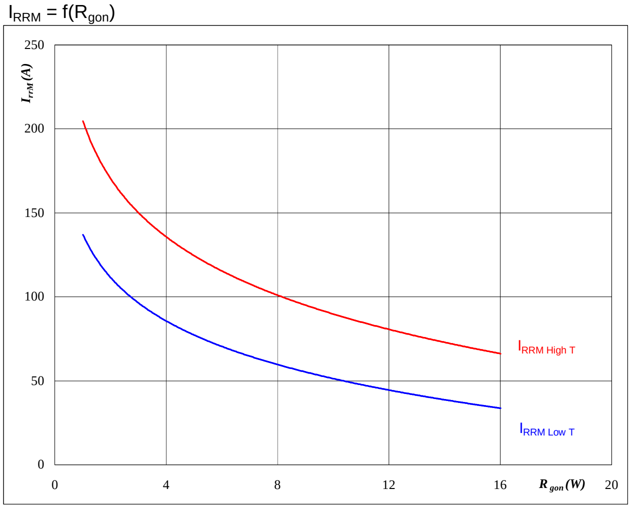
At

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

Figure 16 Diode

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

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



At

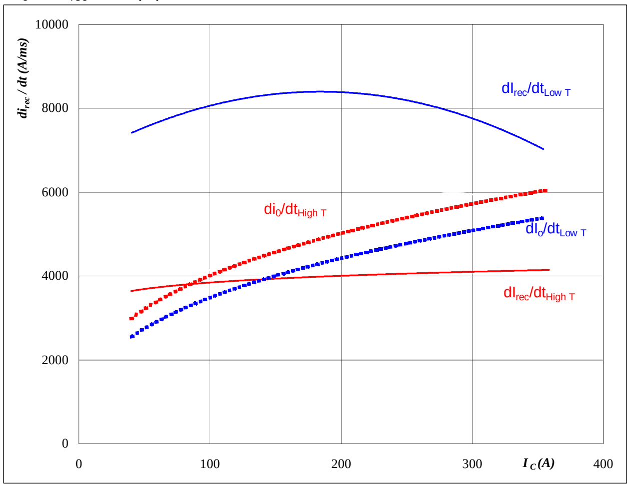
T_j =	25/125	℃
V_R =	350	V
I_F =	200	A
V_{GE} =	±15	V

Buck

Figure 17 Diode

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

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



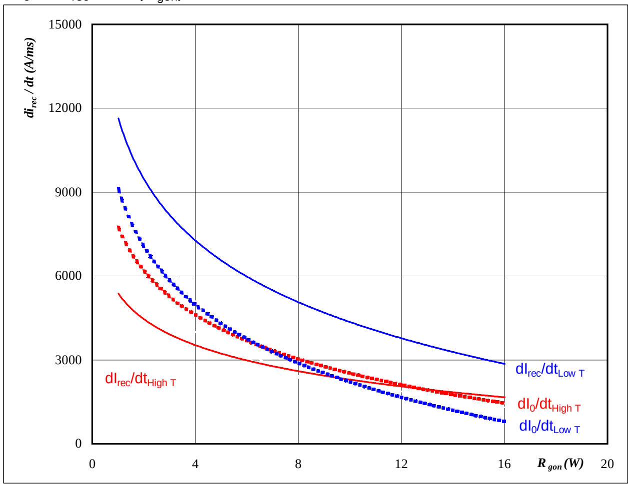
At

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

Figure 18 Diode

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

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



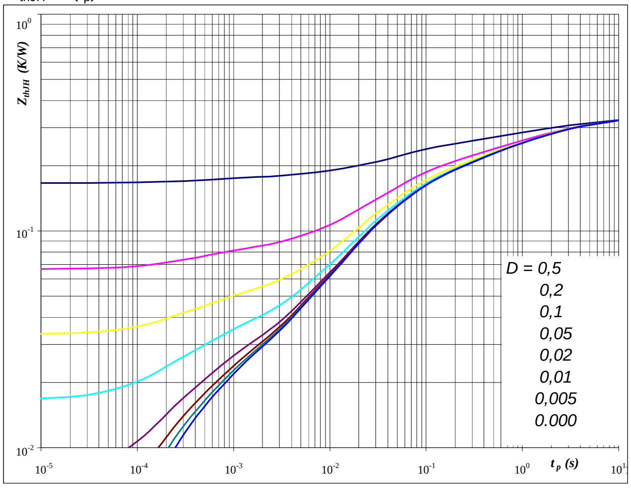
At

T_j =	25/125	℃
V_R =	350	V
I_F =	200	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} =	0,33	K/W

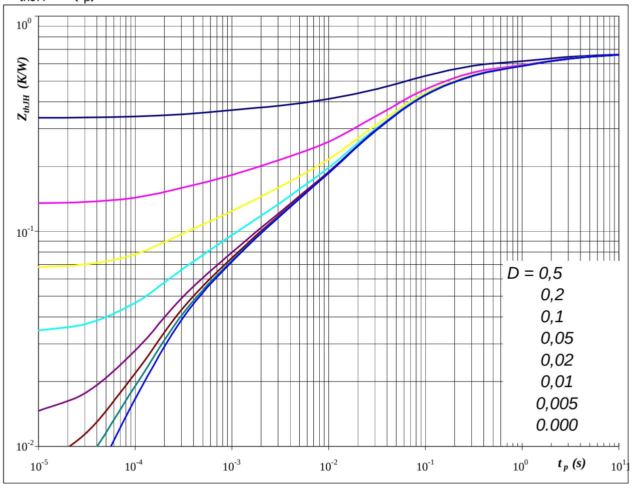
IGBT thermal model values

R (C/W)	Tau (s)
0,05	5,4E+00
0,08	1,2E+00
0,07	1,9E-01
0,10	3,1E-02
0,02	4,2E-03
0,02	3,4E-04

Figure 20 Diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0,67	K/W

Diode thermal model values

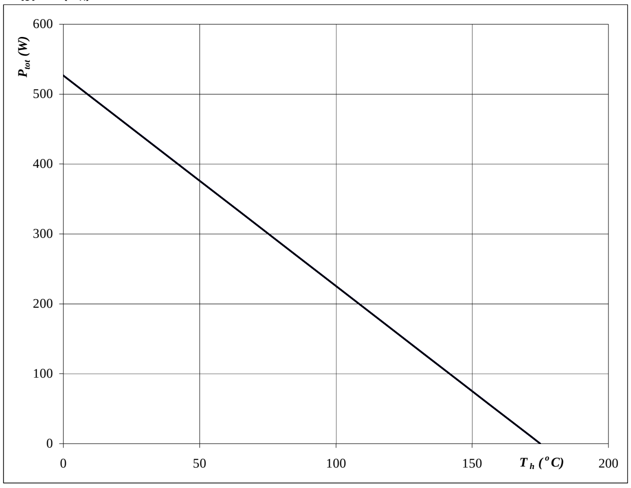
R (C/W)	Tau (s)
0,05	6,2E+00
0,11	1,1E+00
0,23	1,1E-01
0,18	2,4E-02
0,06	2,3E-03
0,04	2,6E-04

Buck

Figure 21 IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



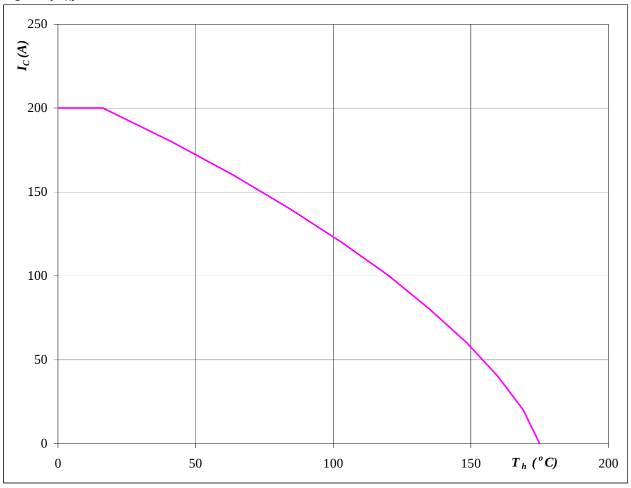
At

T_j = 175 °C

Figure 22 IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

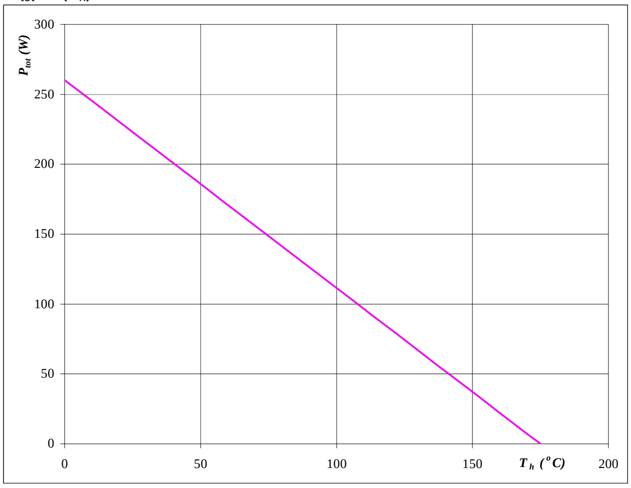
T_j = 175 °C

V_{GE} = 15 V

Figure 23 Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



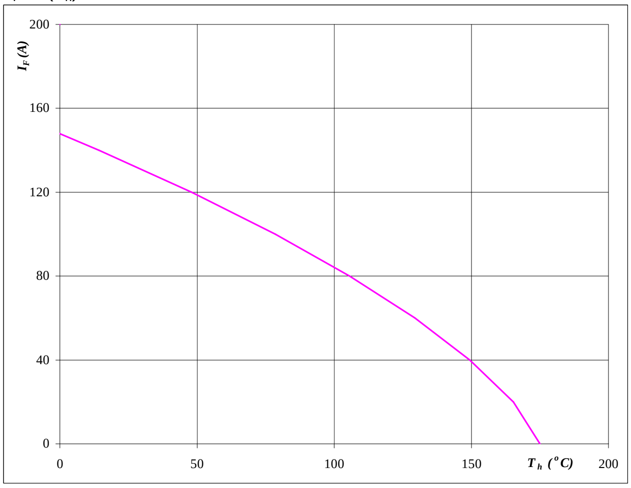
At

T_j = 175 °C

Figure 24 Diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

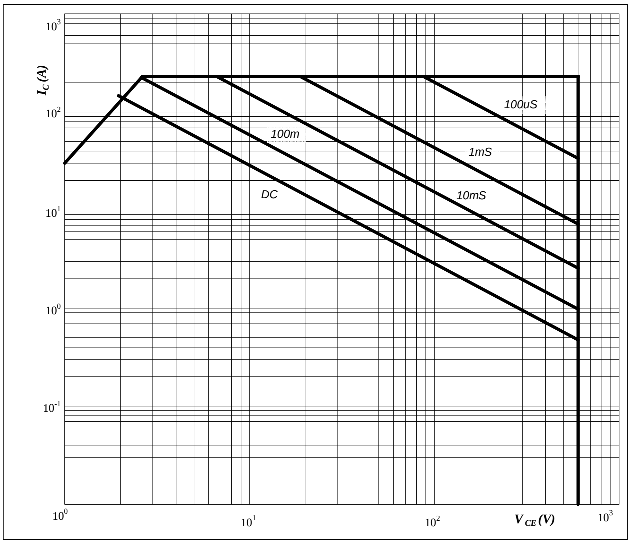
T_j = 175 °C

Buck

Figure 25	IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



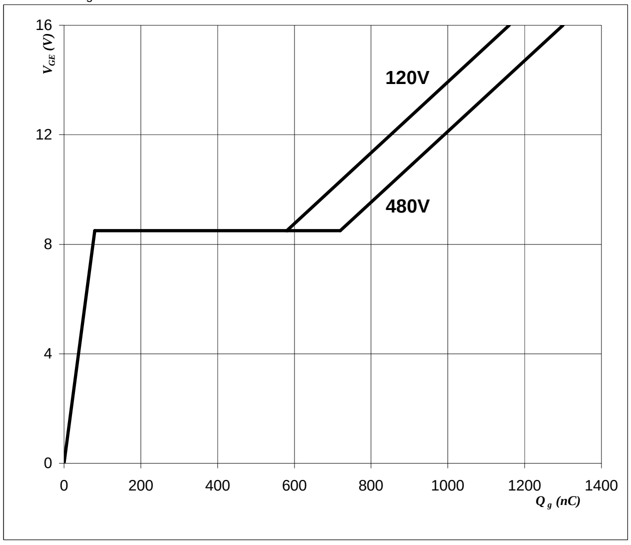
At

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

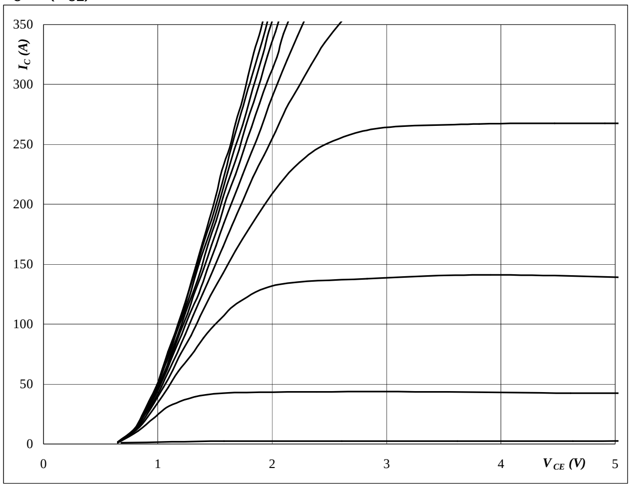
I_C =	200	A

Boost

Figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



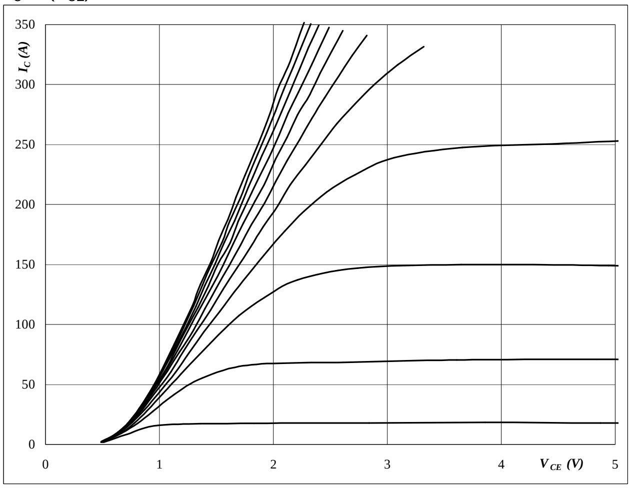
At

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

Figure 2 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



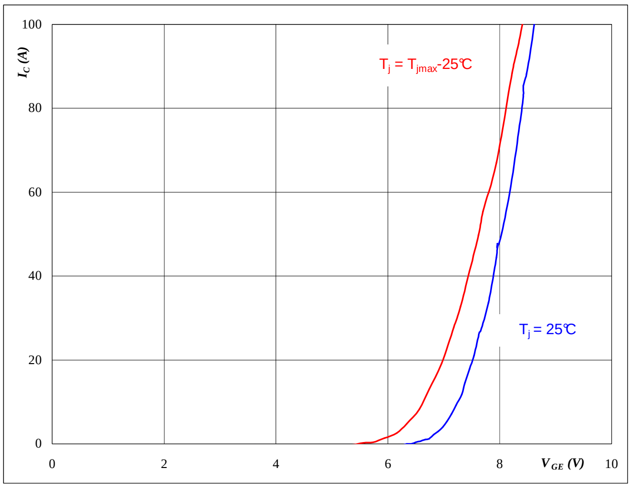
At

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

Figure 3 IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



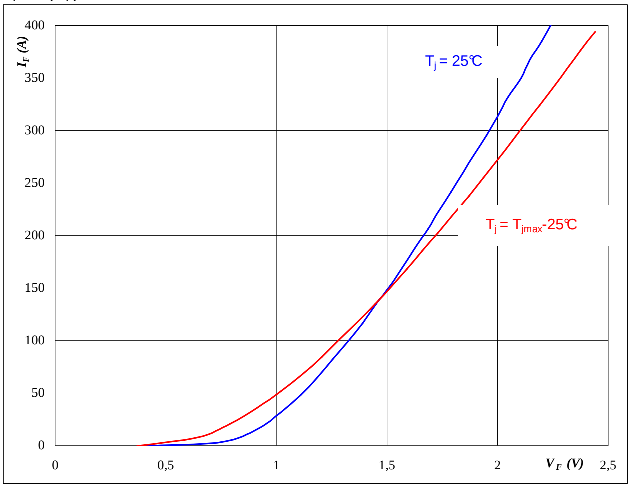
At

t_p =	250	μs
V_{CE} =	10	V

Figure 4 Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

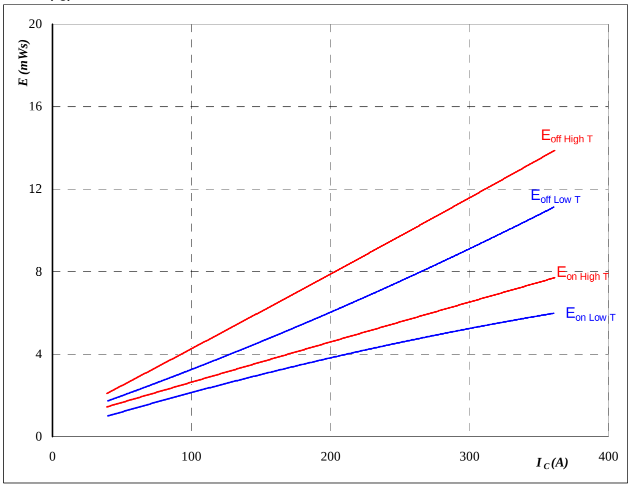
t_p =	250	μs

Boost

Figure 5 IGBT

Typical switching energy losses
as a function of collector current

E = f(I_C)



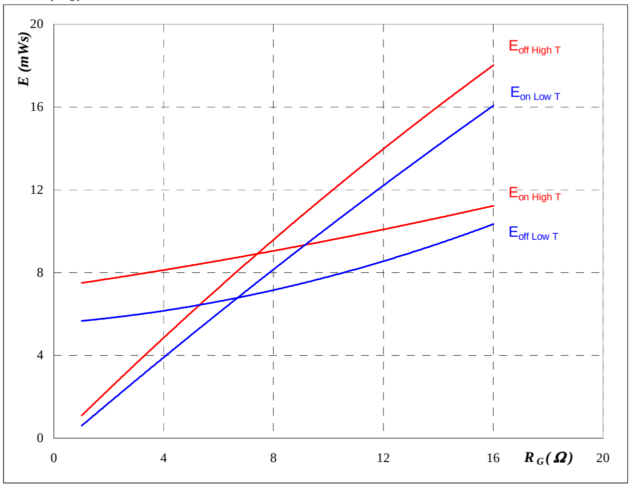
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±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)



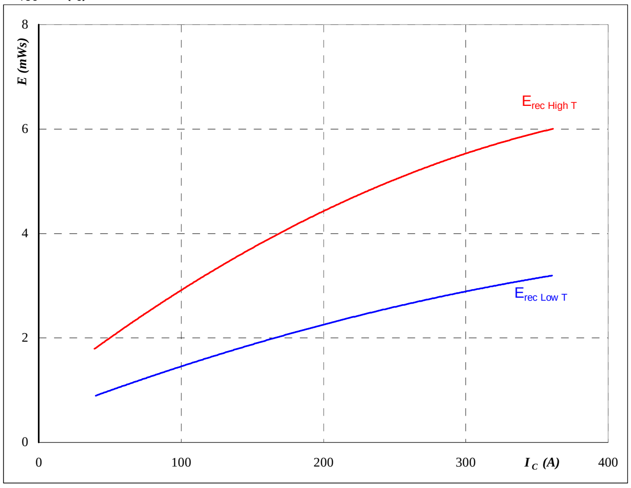
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	200	A

Figure 7 IGBT

Typical reverse recovery energy loss
as a function of collector current

E_{rec} = f(I_c)



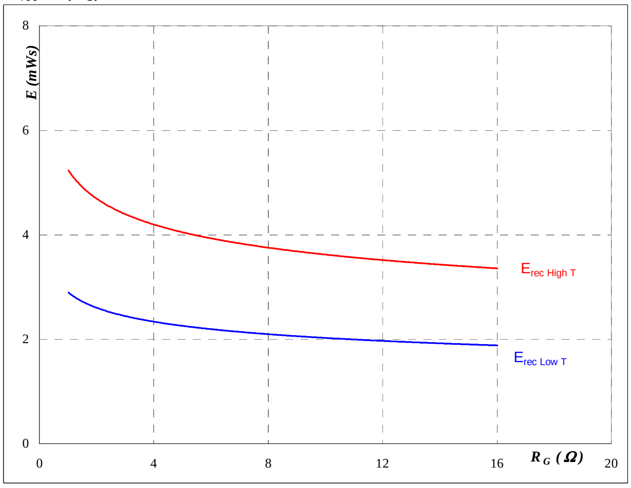
With an inductive load at

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

Figure 8 IGBT

Typical reverse recovery energy loss
as a function of gate resistor

E_{rec} = f(R_G)



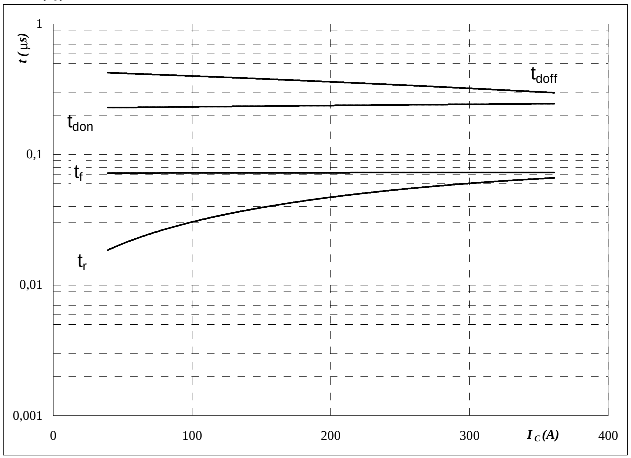
With an inductive load at

T_j =	25/125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	200	A

Boost

Figure 9	IGBT

Typical switching times as a function of collector current
$t = f(I_C)$

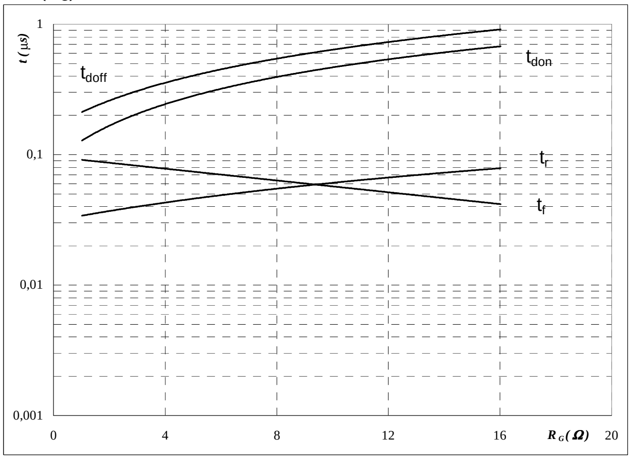


With an inductive load at

T_j =	125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 10	IGBT

Typical switching times as a function of gate resistor
$t = f(R_G)$

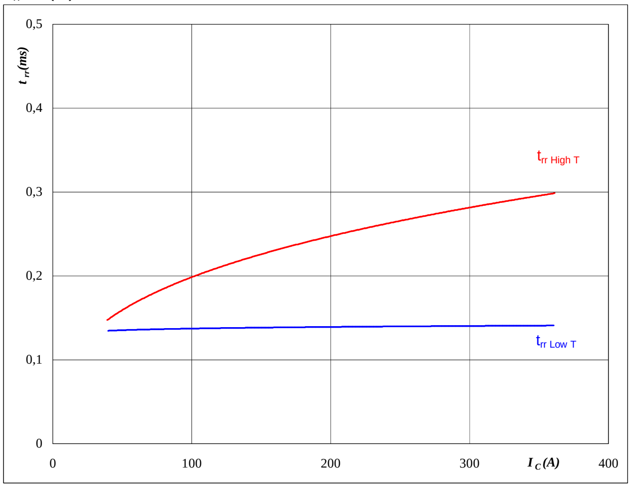


With an inductive load at

T_j =	125	℃
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	200	A

Figure 11	Diode

Typical reverse recovery time as a function of collector current
$t_{rr} = f(Ic)$

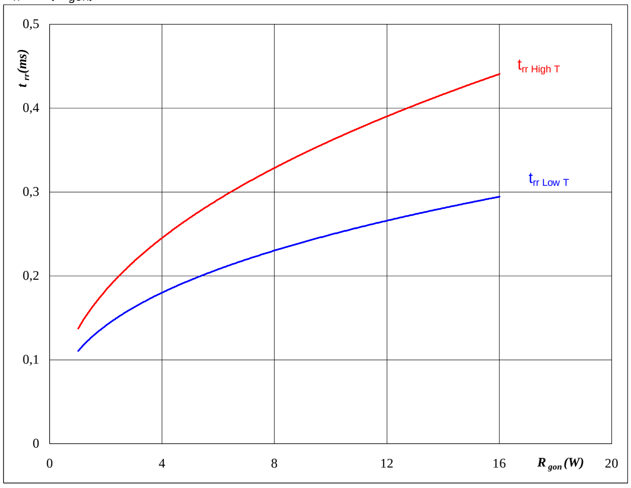


At

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

Figure 12	Diode

Typical reverse recovery time as a function of IGBT turn on gate resistor
$t_{rr} = f(R_{gon})$



At

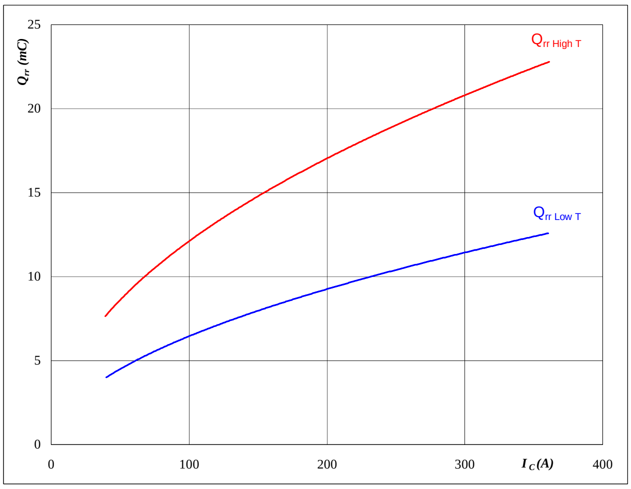
T_j =	25/125	℃
V_R =	350	V
I_F =	200	A
V_{GE} =	±15	V

Boost

Figure 13 Diode

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



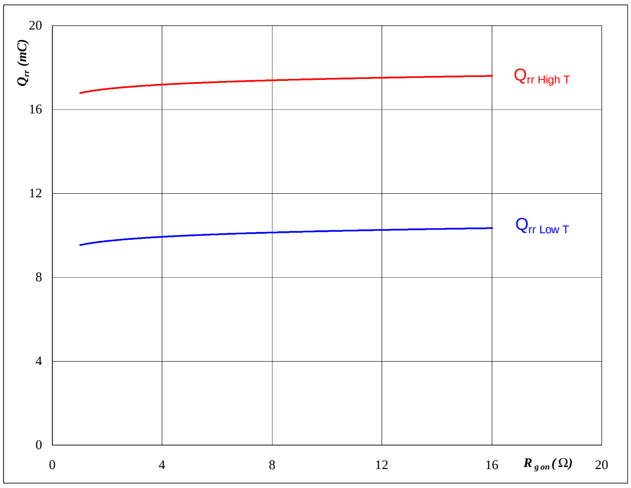
At

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

Figure 14 Diode

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

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



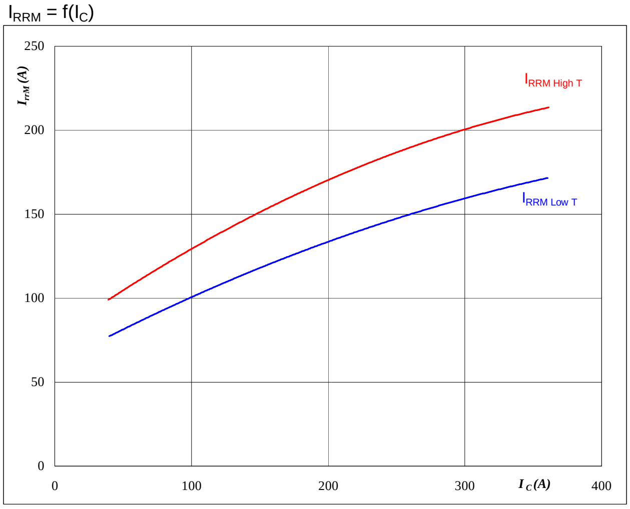
At

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

Figure 15 Diode

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



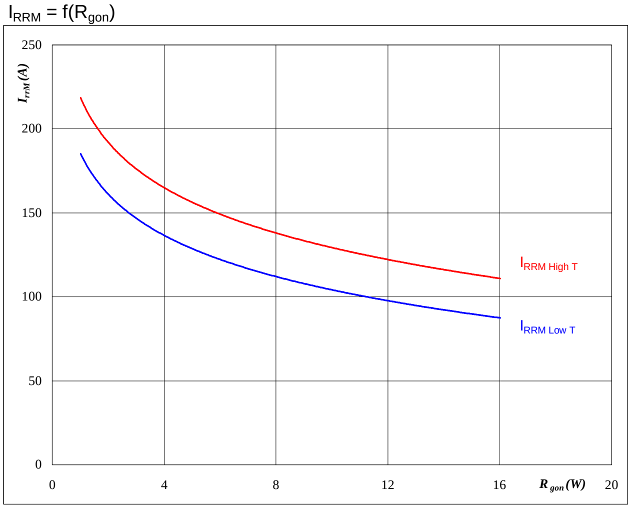
At

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

Figure 16 Diode

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

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



At

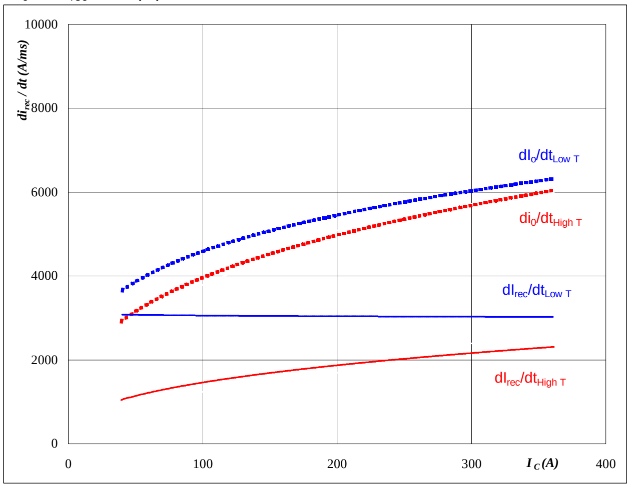
T_j =	25/125	℃
V_R =	350	V
I_F =	200	A
V_{GE} =	±15	V

Boost

Figure 17 Diode

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

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



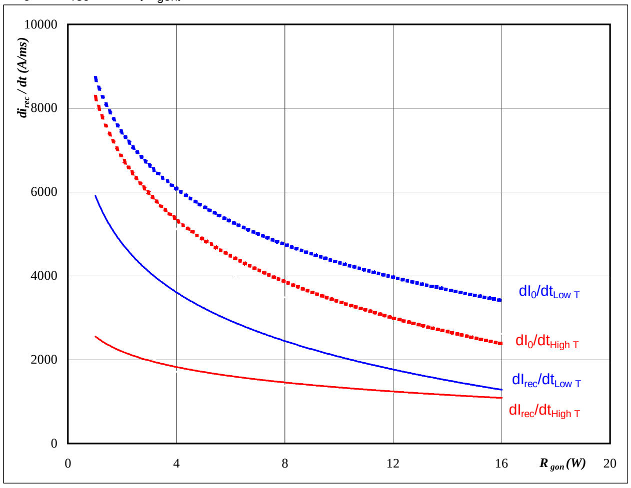
At

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

Figure 18 Diode

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

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



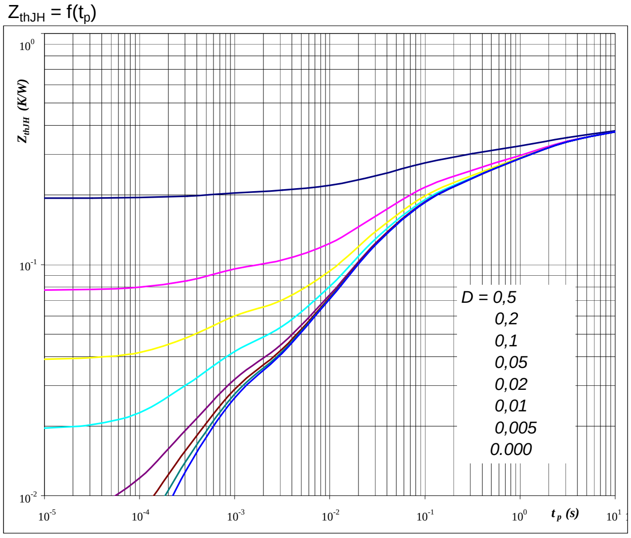
At

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

Figure 19 IGBT

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	tp / T	
R_{thJH} =	0,39	K/W

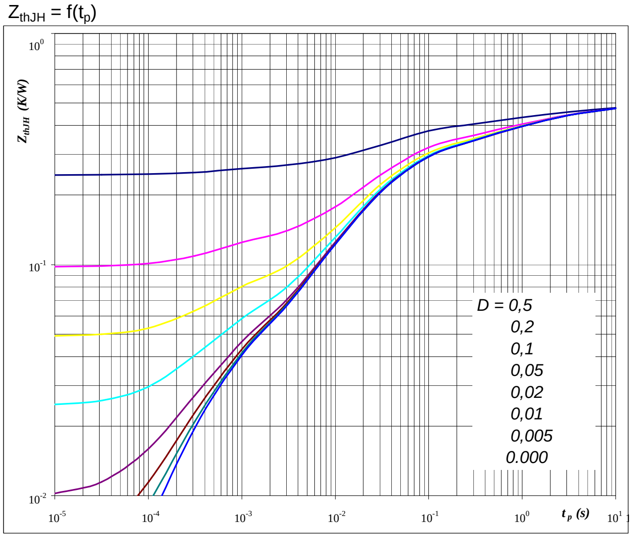
IGBT thermal model values

R (C/W)	Tau (s)
0,02	1,2E+01
0,10	2,6E+00
0,07	4,8E-01
0,11	5,9E-02
0,05	1,3E-02
0,02	4,9E-04

Figure 20 Diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	tp / T	
R_{thJH} =	0,49	K/W

Diode thermal model values

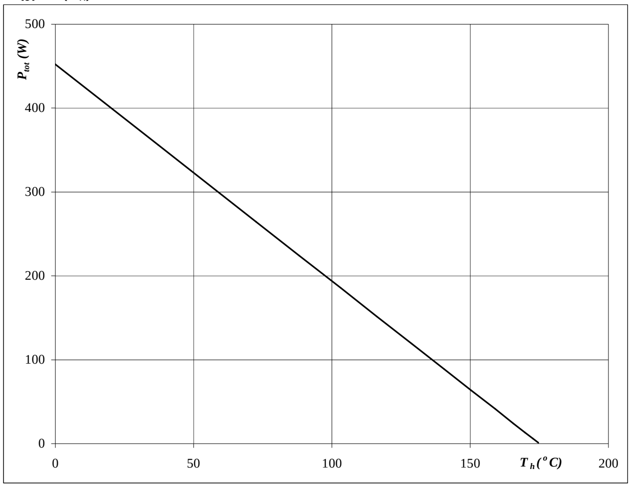
R (C/W)	Tau (s)
0,04	9,5E+00
0,09	1,8E+00
0,08	2,9E-01
0,18	3,6E-02
0,06	8,5E-03
0,03	4,7E-04

Boost

Figure 21	IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



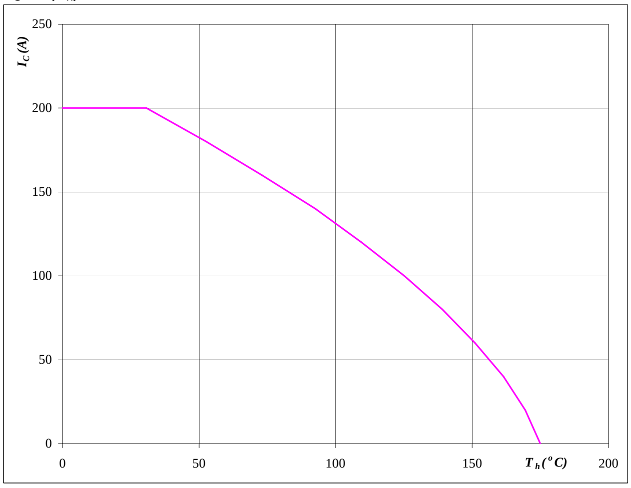
At

T_j = 175 ºC

Figure 22	IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

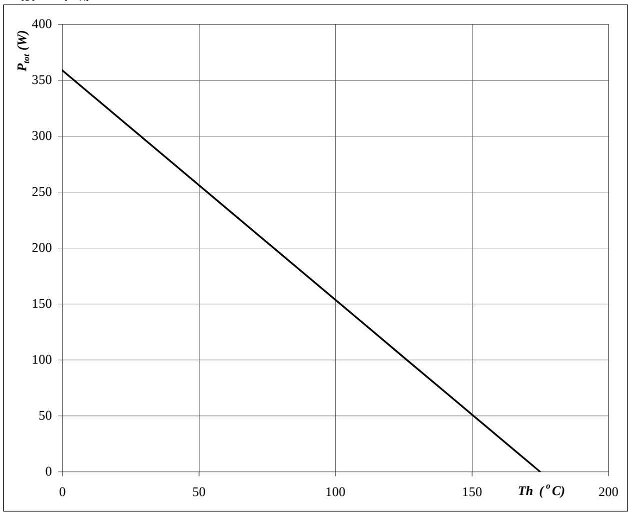
T_j = 175 ºC

V_{GE} = 15 V

Figure 23	Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



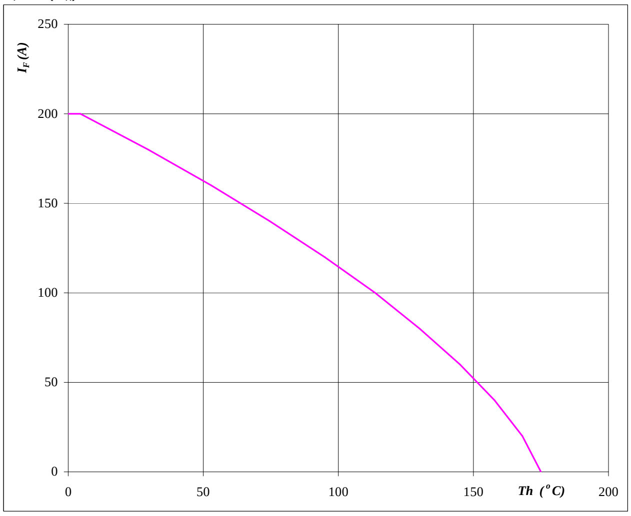
At

T_j = 175 ºC

Figure 24	Diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

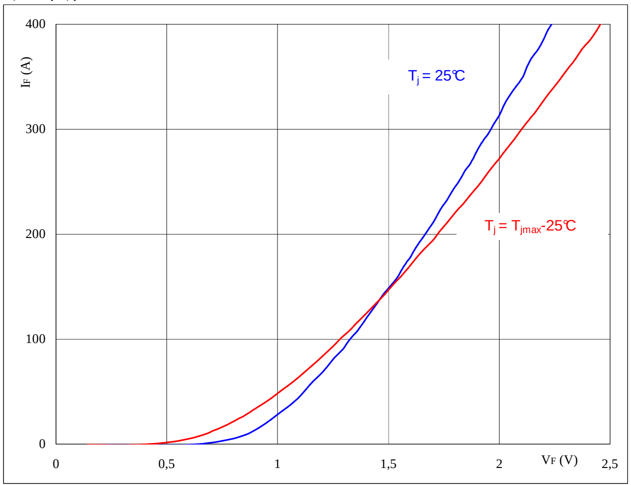
T_j = 175 ºC

Boost

Figure 25	Boost Inverse Diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



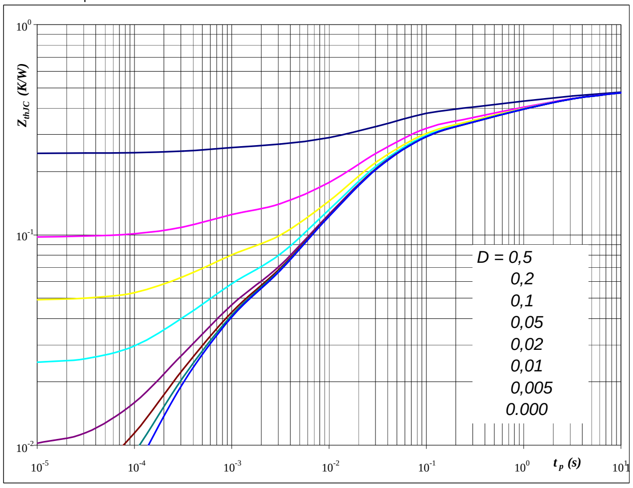
At

t_p = 250 µs

Figure 26	Boost Inverse Diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

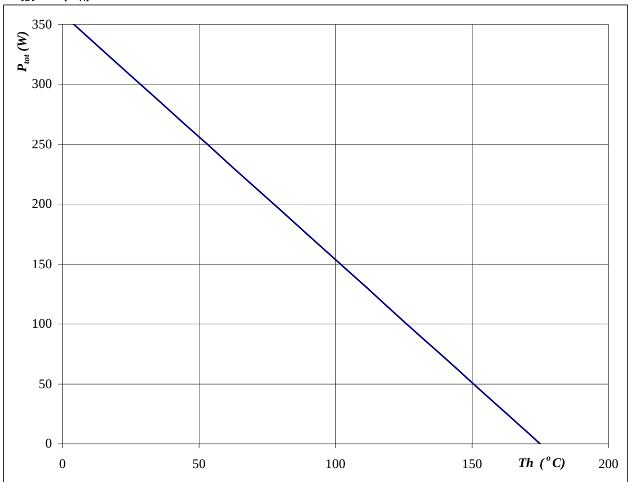
D = tp / T

R_{thJH} = 0,49 K/W

Figure 27	Boost Inverse Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



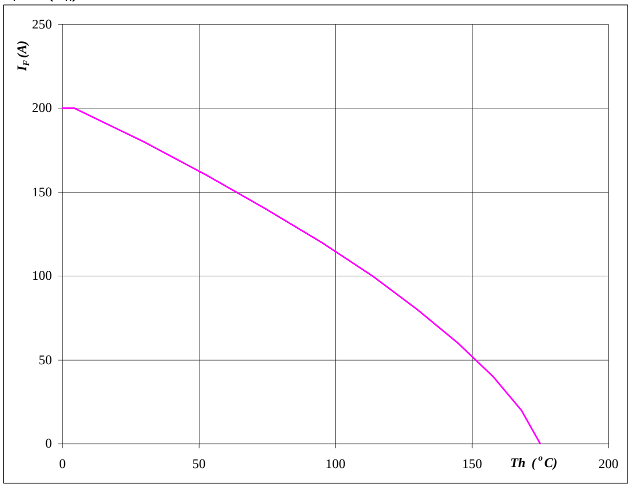
At

T_j = 175 ºC

Figure 28	Boost Inverse Diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



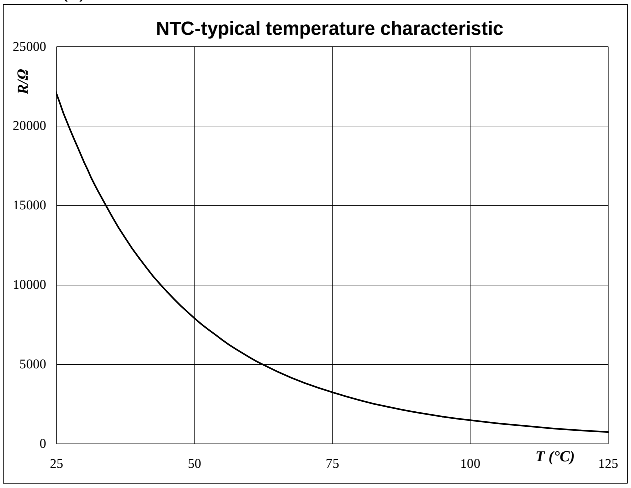
At

T_j = 175 ºC

Thermistor

Figure 1	Thermistor

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



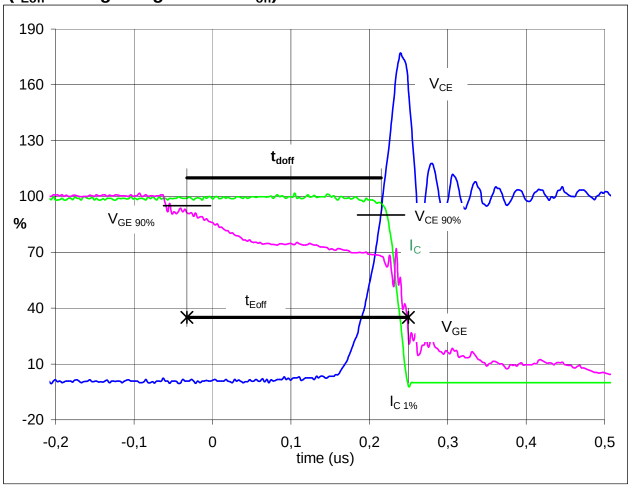
Switching Definitions BUCK MOSFET

General conditions

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

Figure 1 Output inverter IGBT

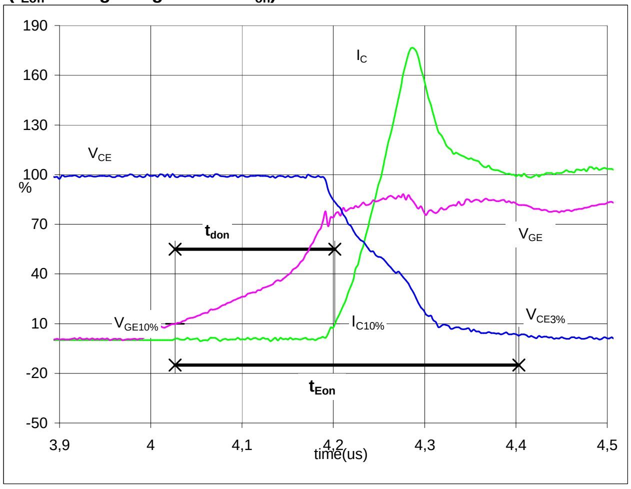
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	200	A
t_{doff} =	0,27	μs
t_{Eoff} =	0,28	μs

Figure 2 Output inverter IGBT

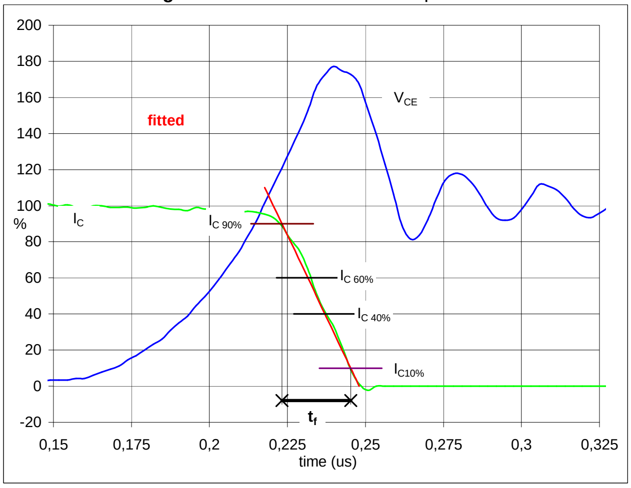
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	350	V
I_C (100%) =	200	A
t_{don} =	0,20	μs
t_{Eon} =	0,38	μs

Figure 3 Output inverter IGBT

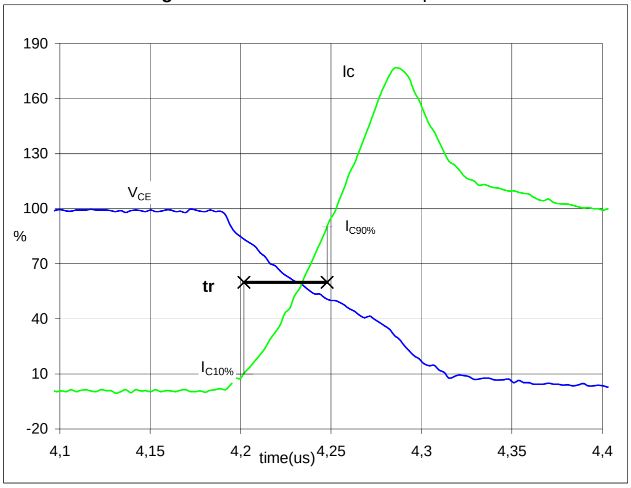
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	350	V
I_C (100%) =	200	A
t_f =	0,02	μs

Figure 4 Output inverter IGBT

Turn-on Switching Waveforms & definition of t_r

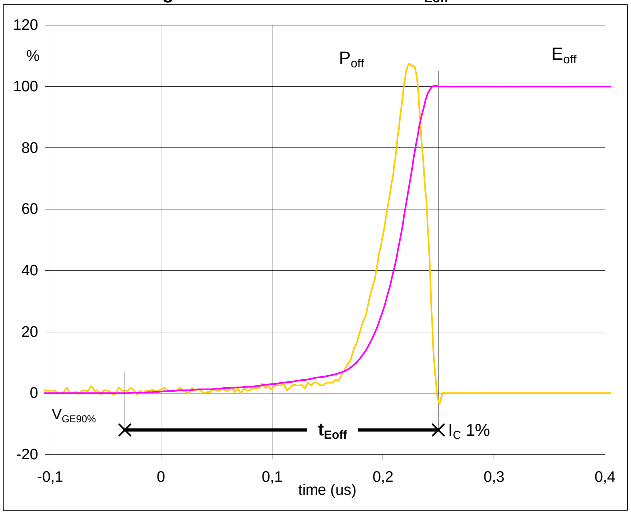


V_C (100%) =	350	V
I_C (100%) =	200	A
t_r =	0,05	μs

Switching Definitions BUCK MOSFET

Figure 5 Output inverter IGBT

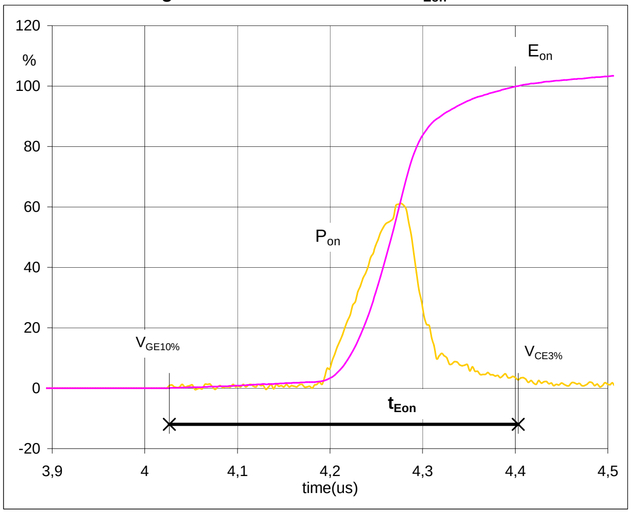
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	69,97	kW
E_{off} (100%) =	3,38	mJ
t_{Eoff} =	0,28	μs

Figure 6 Output inverter IGBT

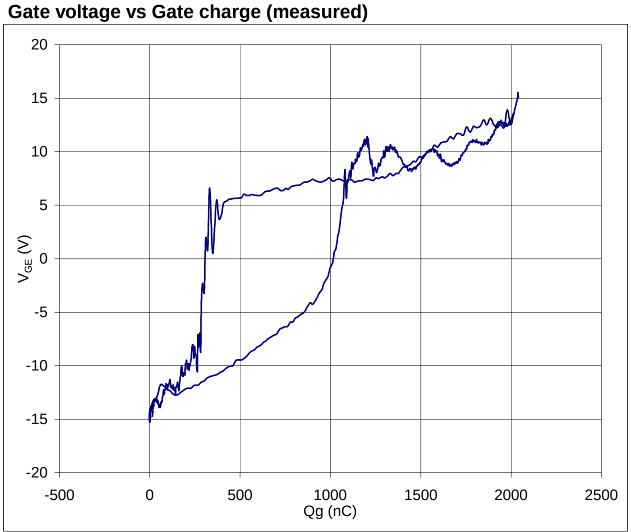
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	69,97	kW
E_{on} (100%) =	3,48	mJ
t_{Eon} =	0,38	μs

Figure 7 Output inverter IGBT

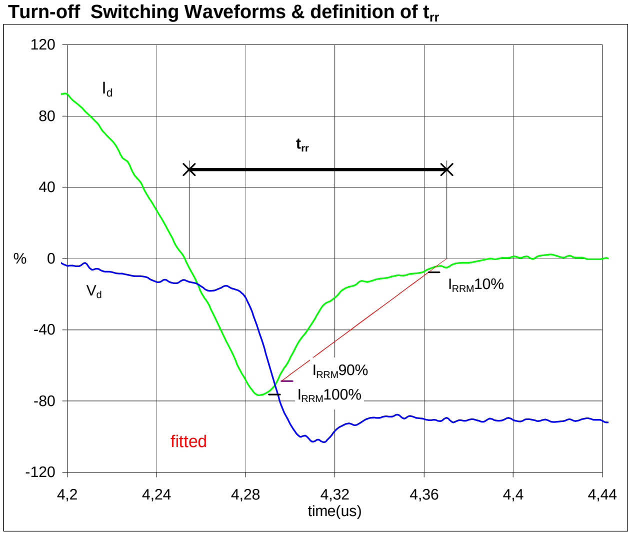
Gate voltage vs Gate charge (measured)



V_{GEoff} =	-15	V
V_{GEon} =	15	V
V_C (100%) =	350	V
I_C (100%) =	200	A
Q_g =	2037,49	nC

Figure 8 Output inverter IGBT

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

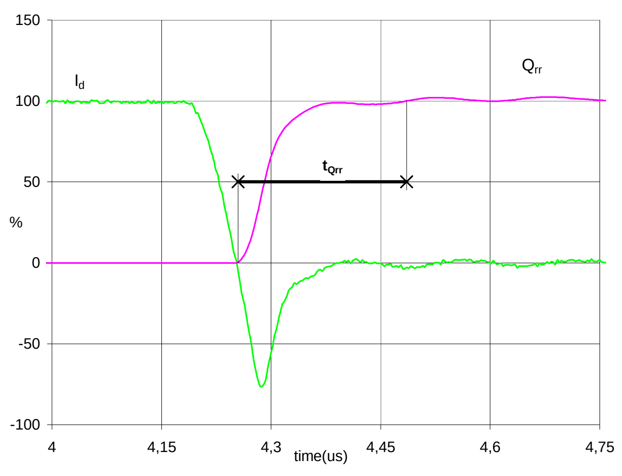


V_d (100%) =	350	V
I_d (100%) =	200	A
I_{RRM} (100%) =	-154	A
t_{rr} =	0,11	μs

Switching Definitions BUCK MOSFET

Figure 9	Output inverter FWD

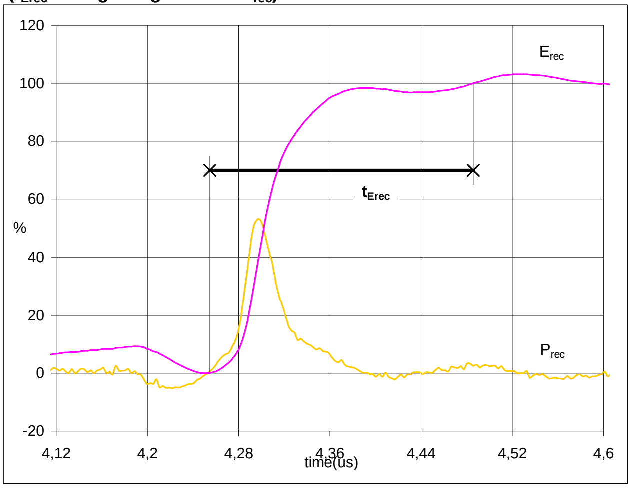
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	200	A
Q_{rr} (100%) =	7,28	μC
t_{Qrr} =	0,23	μs

Figure 10	Output inverter FWD

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



P_{rec} (100%) =	69,97	kW
E_{rec} (100%) =	1,54	mJ
t_{Erec} =	0,23	μs

Measurement circuits

Figure 11

BUCK stage switching measurement circuit

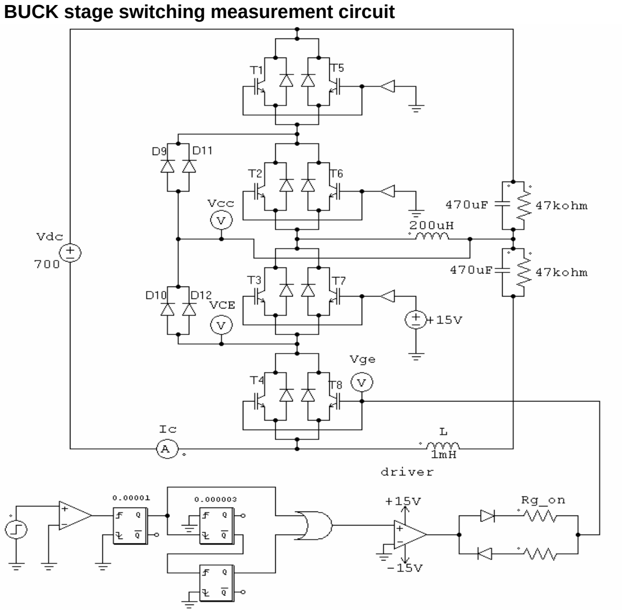
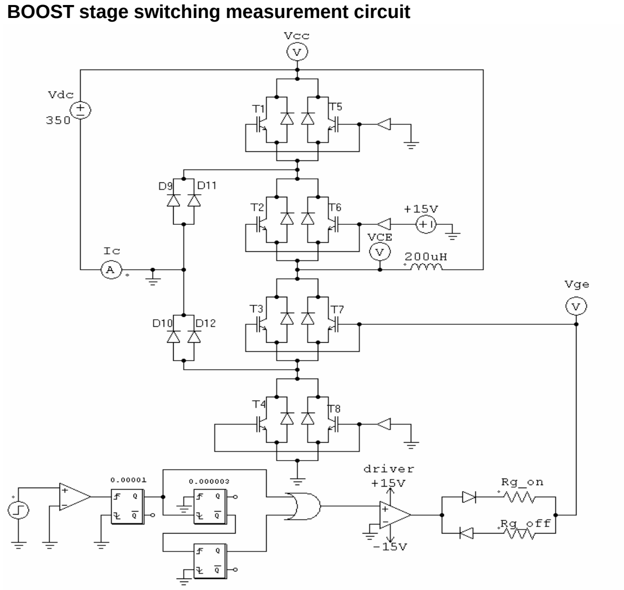


Figure 12

BOOST stage switching measurement circuit



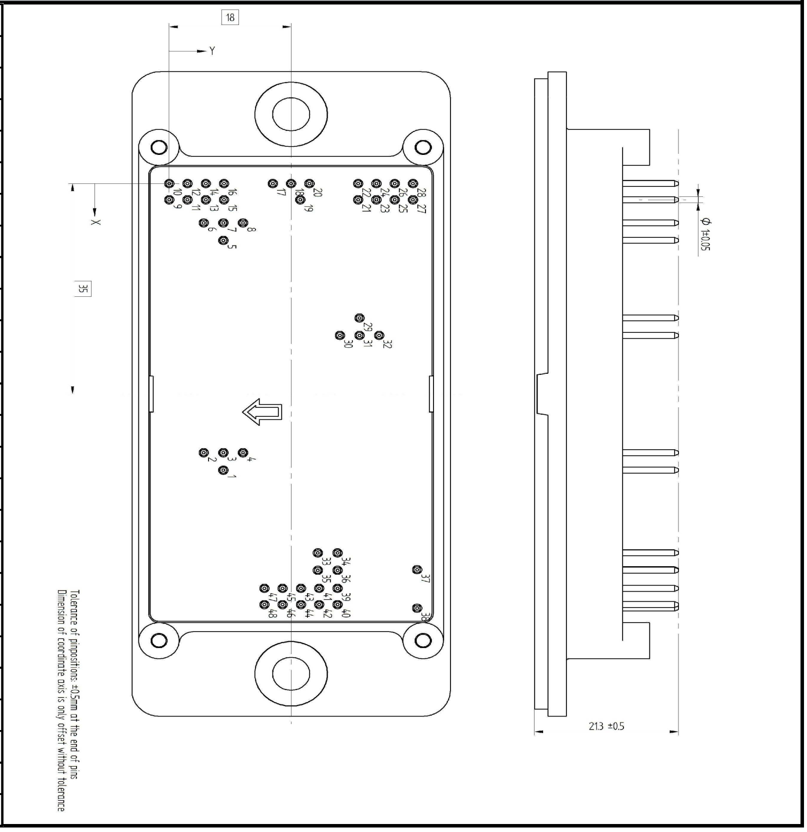
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

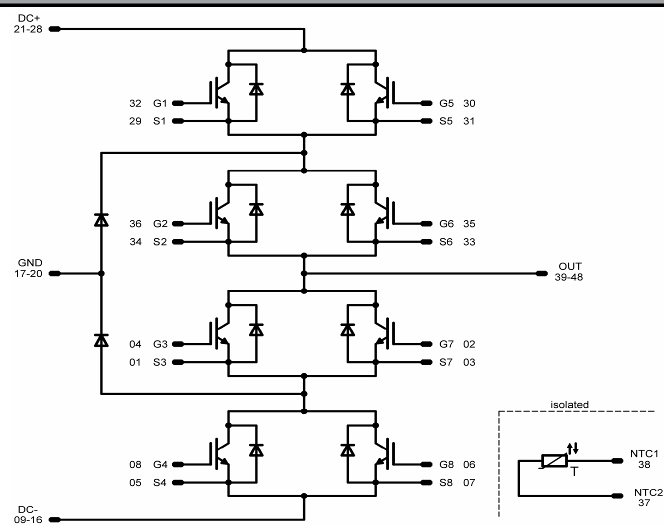
Version	Ordering Code	in DataMatrix as	in packaging barcode as
Standard in flow2 housing	30-F206NIA200SG-M105F25	M105F25	M105F25

Outline

Pin table				Pin table			
Pin	Note 1	X	Y	Pin	Note 1	X	Y
1	S3	47,65	8	25	DC+	2,7	33,3
2	G7	44,75	5,1	26	DC+	0	33,3
3	S7	44,75	8	27	DC+	2,7	36
4	G3	44,75	10,9	28	DC+	0	36
5	S4	9,45	8	29	S1	22,35	28,1
6	G8	6,55	5,1	30	G5	25,25	25,2
7	S8	6,55	8	31	S5	25,25	28,1
8	G4	6,55	10,9	32	G1	25,25	31
9	DC-	2,7	0	33	S6	61,4	21,95
10	DC-	0	0	34	S2	61,4	24,85
11	DC-	2,7	2,7	35	G6	64,3	21,95
12	DC-	0	2,7	36	G2	64,3	24,85
13	DC-	2,7	5,4	37	NTC2	64,2	36,6
14	DC-	0	5,4	38	NTC1	70,6	36,6
15	DC-	2,7	8,1	39	OUT	67,3	24,85
16	DC-	0	8,1	40	OUT	70	24,85
17	GND	0	15,3	41	OUT	67,3	22,15
18	GND	0	18	42	OUT	70	22,15
19	GND	2,7	19,35	43	OUT	67,3	19,45
20	GND	0	20,7	44	OUT	70	19,45
21	DC+	2,7	27,9	45	OUT	67,3	16,75
22	DC+	0	27,9	46	OUT	70	16,75
23	DC+	2,7	30,6	47	OUT	67,3	14,05
24	DC+	0	30,6	48	OUT	70	14,05



Pinout



PRODUCT STATUS DEFINITIONS

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