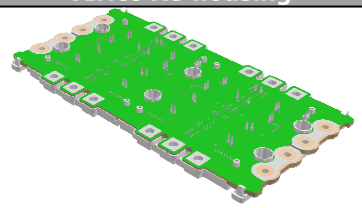
VINcoNPC X8 | **2400 V / 800 A**

Features

- 2400 V NPC-topology (2x 1200 V)
- High power screw interface
- Low inductive interface for external DC-capacitors and paralleling on component level
- Snubber diode for optional asymmetrical inductance
- High speed buck IGBT´s
- Temperature sensor

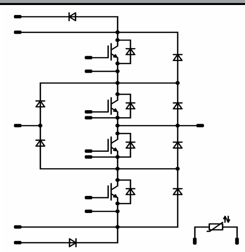
VINco X8 housing



Target Applications

- Solar inverter
- Wind Power
- Motor Drive

Schematic



Types

- 70-W424NIA800SH-M800F

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Snubber Diode (D61, D62)					
Repetitive peak reverse voltage	V_{RRM}			1200	V
Forward average current	I_{FAV}	sine , d = 0.5 $T_j = T_{jmax}$	T_s = 80 °C	181	A
Surge forward current	I_{FSM}	t_p = 10ms, sin 180º	T_j = 150°C	1080	A
I^2t-value	I^2t			5832	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	323	W
Maximum Junction Temperature	T_{jmax}			175	°C
Buck IGBT (T11, T12)					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	651	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		2400	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1759	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		10 800	μs V
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Buck Diode (D11, D12)					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	540	A
Surge Forward Current	I_{FSM}	t_p = 10ms, sin 180º		4400	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1131	W
Maximum Junction Temperature	T_{jmax}			175	°C
Boost IGBT (T13, T14)					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	689	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		2400	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1652	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		10 800	μs V
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Inverse Diode (D15, D16)					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	680	A
Repetitive Forward Current	I_{FRM}	t_p limited by T_{jmax}		1200	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1759	W
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Diode (D14, D13)					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	514	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1200	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	905	W
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}	for power part		-40…+(T_{jmax} - 25)	°C
Insulation Properties					
Insulation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	4000	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm
Comparative Tracking Index	CTI			>200	

*100% tested in production

Characteristic values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Snubber Diode (D61, D62)										
Forward voltage	V_F				200	25 125		1,91 1,85	2,54	V
Threshold voltage (for power loss calc. only)	V_{to}				200	25 125		1,25 1,11		V
Slope resistance (for power loss calc. only)	r_t				200	25 125		0,003 0,004		mΩ
Reverse current	I_r			1200		25 150			0,12	mA
Thermal resistance chip to heatsink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,294		K/W
Thermal resistance chip to case	$R_{th(j-c)}$							0,194		
Buck IGBT (T11, T12)										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0272	25 125	5,2	5,8	6,4	V
Collector-emitter saturation voltage	V_{CEsat}		15		800	25 125	1,7	2,14 2,44	2,4	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		25 125			0,096	mA
Gate-emitter leakage current	I_{GES}		20	0		25 125			1920	nA
Integrated Gate resistor	R_{gint}							0,25		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 0,5 Ω R_{gon} = 0,5 Ω	±15	600	824	25 125		151 135		ns
Rise time	t_r					25 125		42 40		
Turn-off delay time	$t_{d(off)}$					25 125		195 231		
Fall time	t_f					25 125		24 48		
Turn-on energy loss per pulse	E_{on}					25 125		41 50		mWs
Turn-off energy loss per pulse	E_{off}					25 125		26 43		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		44320		pF
Output capacitance	C_{oss}							2600		
Reverse transfer capacitance	C_{rss}							2560		
Gate charge	Q_G		±15	960	800	25		6080		nC
Thermal resistance chip to heatsink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,052		K/W
Thermal resistance chip to case	$R_{th(j-c)}$							0,035		
Buck Diode (D11, D12)										
Diode forward voltage	V_F				800	25 125		2,34 2,38	2,52	V
Reverse leakage current	I_R			1200		25 125			960	µA
Reverse recovery time	I_{RRM}	R_{gon} = 0,5 Ω	±15	600	824	25 125		932 1319		A
Reverse recovery time	t_{rr}					25 125		165 193		ns
Reverse recovered charge	Q_{rr}					25 125		64 136		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		16722 16606		A/µs
Reverse recovered energy	E_{rec}					25 125		22 56		mWs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,081		K/W
Thermal resistance chip to case	$R_{th(j-c)}$							0,054		

Characteristic values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Boost IGBT (T13, T14)										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0304	25 125	5	5,80	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		800	25 125	1,55	1,91 2,14	2,05	V
Collector-emitter cut-off incl diode	I_{CES}		0	1200		25 125			0,104	mA
Gate-emitter leakage current	I_{GES}		20	0		25 125			4800	nA
Integrated Gate resistor	R_{gint}							0,9375		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 0,5 Ω R_{gon} = 0,5 Ω	±15	600	800	25 125		290 301		ns
Rise time	t_r					25 125		57 60		
Turn-off delay time	$t_{d(off)}$					25 125		384 455		
Fall time	t_f					25 125		43 108		
Turn-on energy loss per pulse	E_{on}					25 125		49 65		mWs
Turn-off energy loss per pulse	E_{off}					25 125		49 76		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		49200		pF
Output capacitance	C_{oss}							3240		
Reverse transfer capacitance	C_{rss}							2760		
Gate charge	Q_G		15	960	800	25		6400		nC
Thermal resistance chip to heatsink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,058		K/W
Thermal resistance chip to case	$R_{th(j-c)}$							0,038		
Boost Inverse Diode (D15, D16)										
Diode forward voltage	V_F				600	25 125	1,35	1,90 1,84	2,05	V
Thermal resistance chip to heatsink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,054		K/W
Thermal resistance chip to case	$R_{th(j-c)}$							0,036		
Boost Diode (D14, D13)										
Diode forward voltage	V_F				600	25 125	1,35	1,90 1,84	2,05	V
Reverse leakage current	I_r			1200		25 125			112	μA
Peak reverse recovery current	I_{RRM}	R_{gon} = 0,5 Ω	±15	600	800	25 125		576 806		A
Reverse recovery time	t_{rr}					25 125		271 341		ns
Reverse recovered charge	Q_{rr}					25 125		63 118		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		4456 6686		A/μs
	E_{rec}					25 125		23 47		mWs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,102		K/W
Thermal resistance chip to case	$R_{th(j-c)}$							0,067		

Characteristic values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22000		Ω
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				25	-5		+5	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		3996		K
Vincotech NTC Reference									B	
Module Properties										
Module inductance (from chips to PCB)	L_{sCE}	Buck Boost						9 17		nH
Module inductance (from PCB to PCB using Intercon board)	L_{sCE}							5		nH
Resistance of Intercon boards (from PCB to PCB using Intercon board)	$Rcc_{'1+EE'}$							1,5		mΩ
Mounting torque	M	Screw M4 - mounting according to valid application note VINcoX-*-HI					2		2,2	Nm
Mounting torque	M	Screw M5 - mounting according to valid application note VINcoX-*-HI					4		6	Nm
Terminal connection torque	M	Screw M6 - mounting according to valid application note VINcoX-*-HI					2,5		5	Nm
Weight	G								1300	g

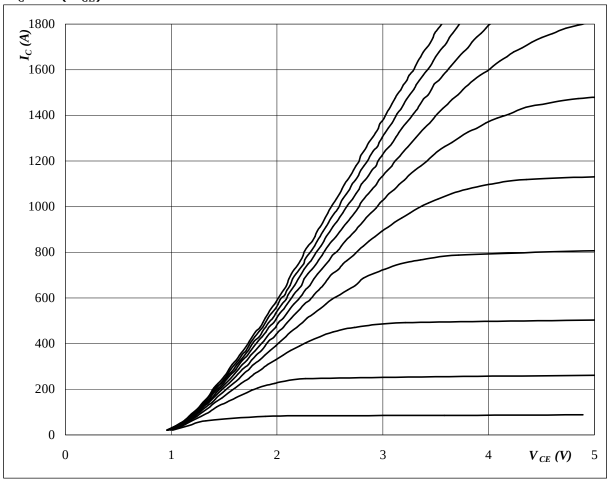
Buck

Buck IGBT and Buck FWD

figure 1.	IGBT

Typical output characteristics

$I_C = f(V_{CE})$



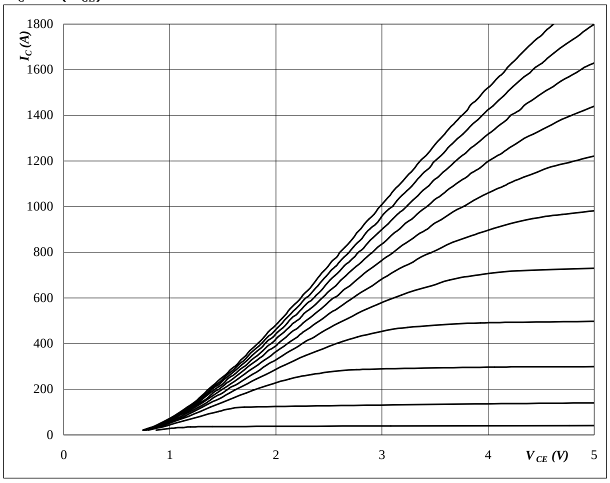
At

t_p =	350	µs
T_j =	25	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 2.	IGBT

Typical output characteristics

$I_C = f(V_{CE})$



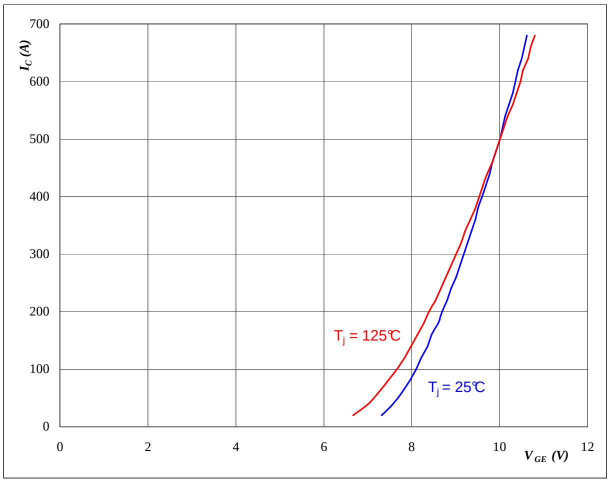
At

t_p =	350	µs
T_j =	125	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3.	IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



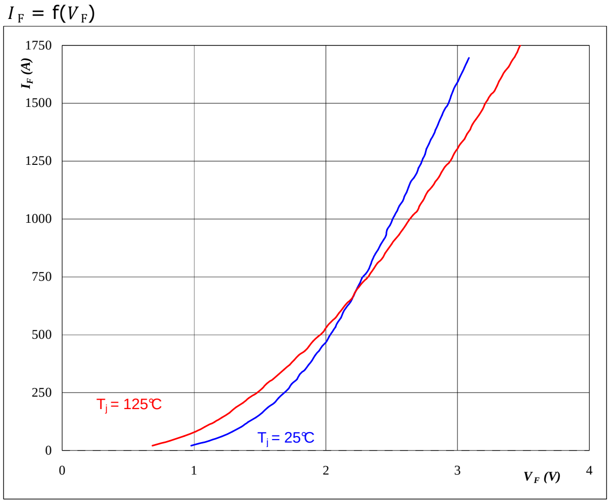
At

t_p =	350	µs
V_{CE} =	10	V

figure 4.	FWD

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p =	350	µs

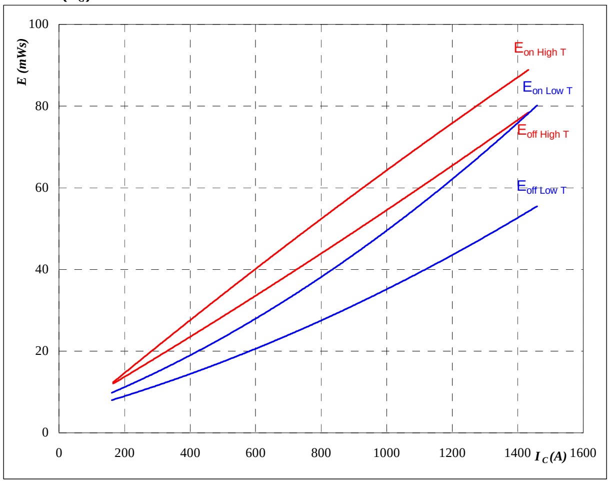
Buck

Buck IGBT and Buck FWD

figure 5. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



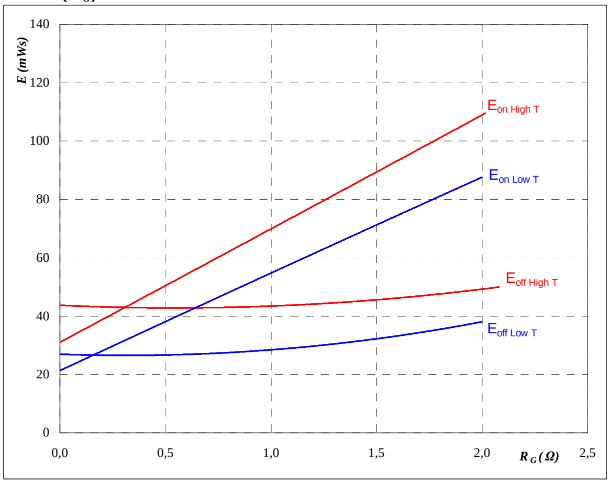
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω
R_{goff} =	0,5	Ω

figure 6. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



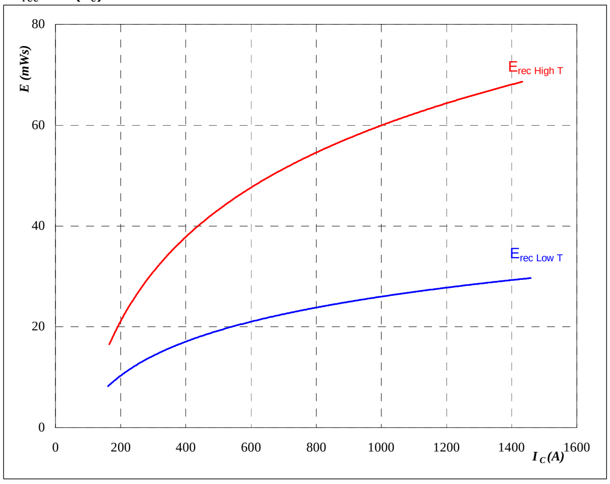
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	824	A

figure 7. **FWD**

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_c)$



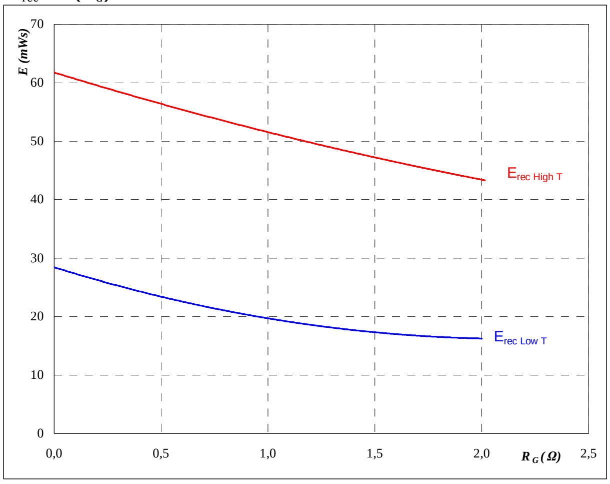
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 8. **FWD**

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	824	A

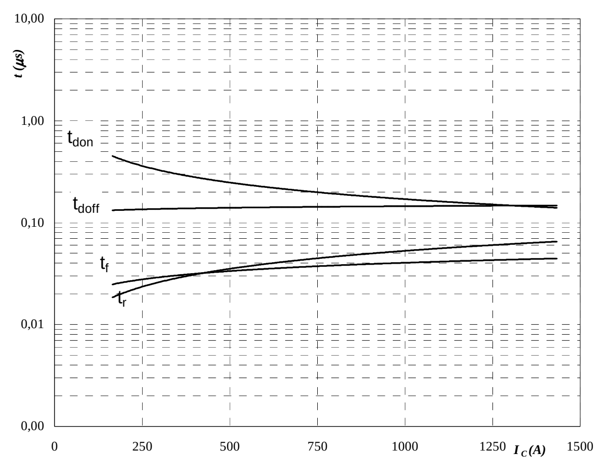
Buck

Buck IGBT and Buck FWD

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



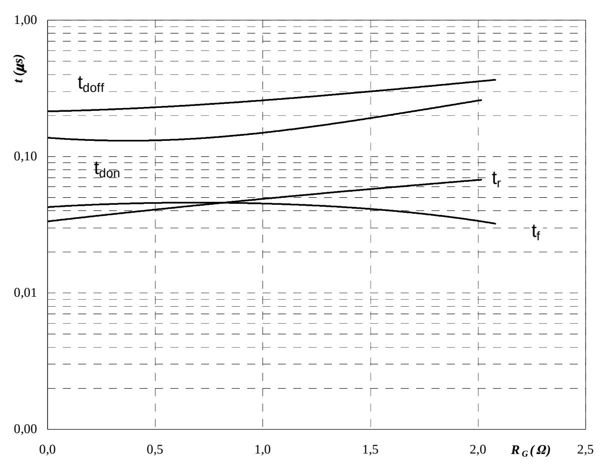
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω
R_{goff} =	0,5	Ω

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



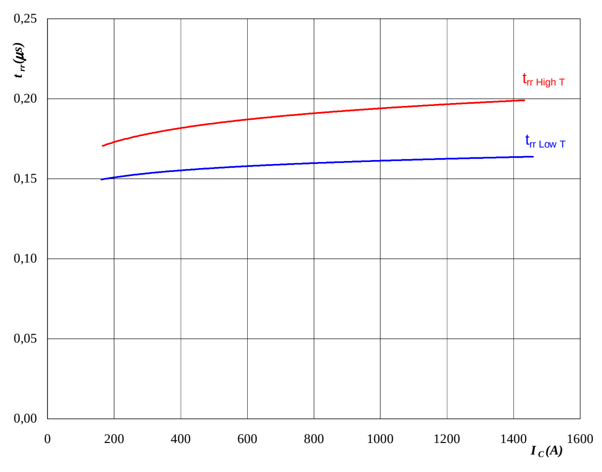
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	824	A

figure 11. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



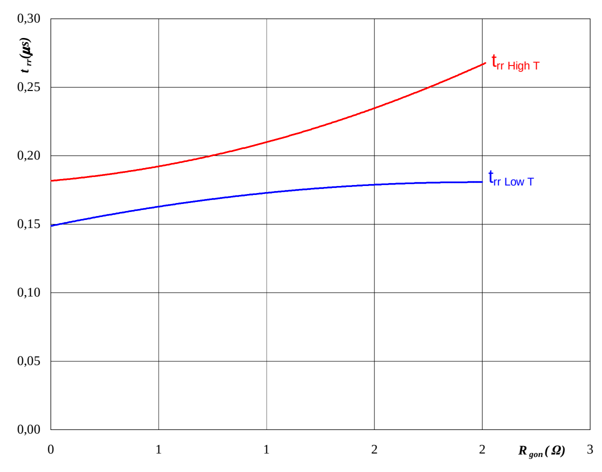
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 12. **FWD**

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

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



At

T_j =	25/125	°C
V_R =	600	V
I_F =	824	A
V_{GE} =	±15	V

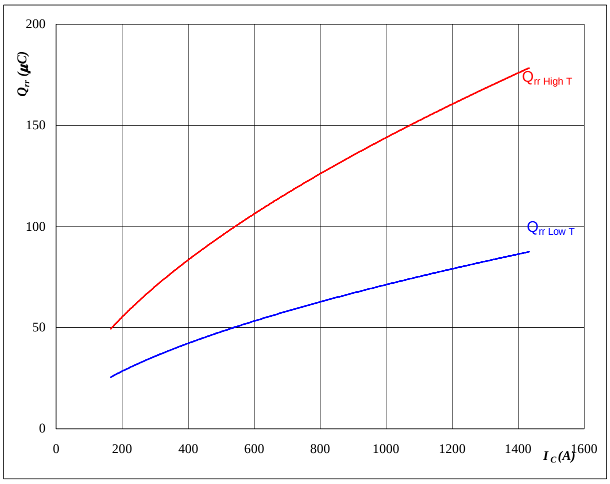
Buck

Buck IGBT and Buck FWD

figure 13.	**FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



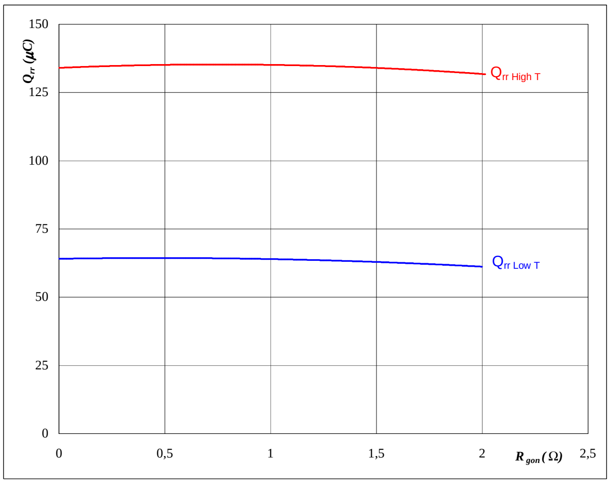
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 14.	**FWD**

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

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



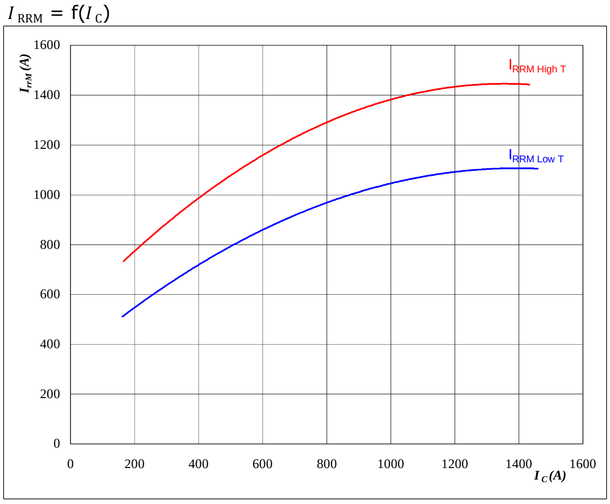
At

T_j =	25/125	°C
V_R =	600	V
I_F =	824	A
V_{GE} =	±15	V

figure 15.	**FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



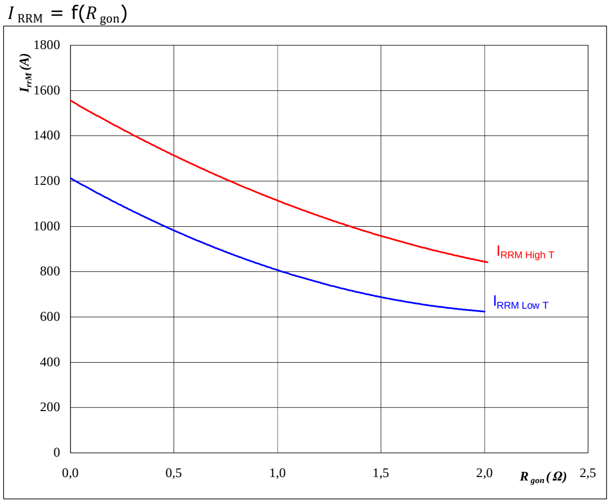
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 16.	**FWD**

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

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



At

T_j =	25/125	°C
V_R =	600	V
I_F =	824	A
V_{GE} =	±15	V

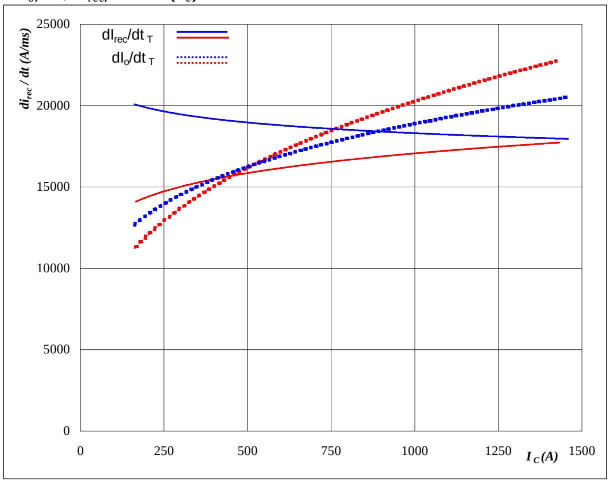
Buck

Buck IGBT and Buck FWD

figure 17. **FWD**

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

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



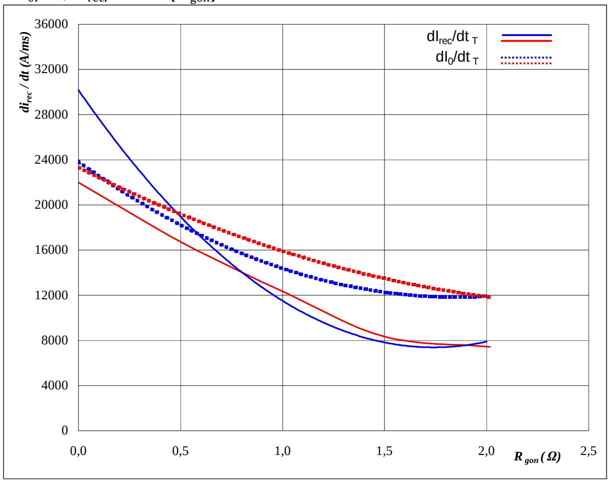
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 18. **FWD**

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

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



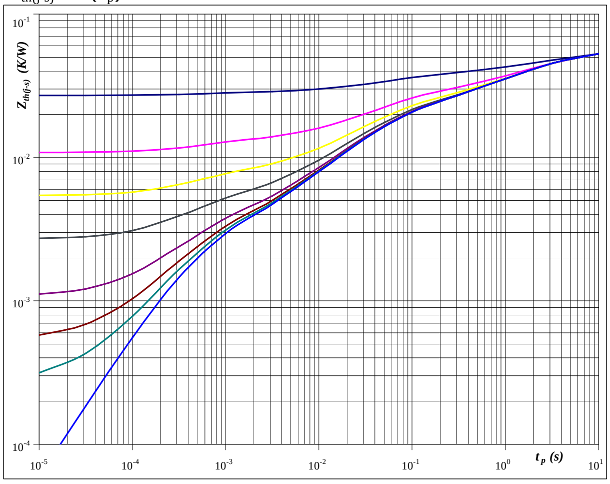
At

T_j =	25/125	°C
V_R =	600	V
I_F =	824	A
V_{GE} =	±15	V

figure 19. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



At

$D = t_p / T$

$R_{th(j-s)}$ = 0,035 K/W

IGBT thermal model values

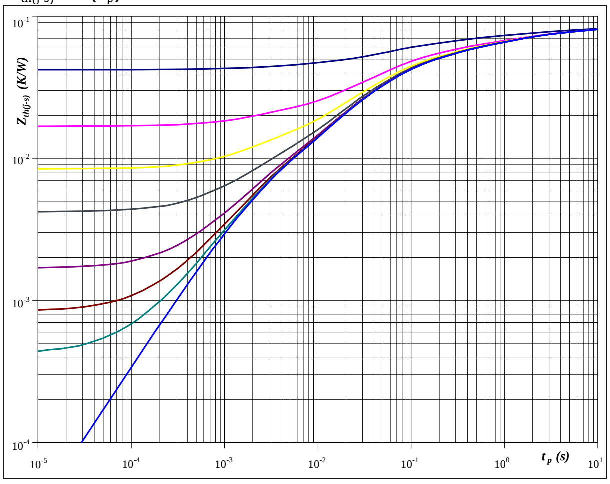
With phase change interface

R (K/W)	Tau (s)
2,17E-02	3,38E+00
9,75E-03	6,30E-01
6,36E-03	1,08E-01
1,02E-02	3,09E-02
1,99E-03	4,92E-03
2,38E-03	4,72E-04

figure 20. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At

$D = t_p / T$

$R_{th(j-s)}$ = 0,054 K/W

FWD thermal model values

With phase change interface

R (K/W)	Tau (s)
8,86E-03	8,79E+00
1,52E-02	1,88E+00
1,55E-02	3,42E-01
2,08E-02	7,47E-02
1,61E-02	2,42E-02
5,04E-03	2,16E-03

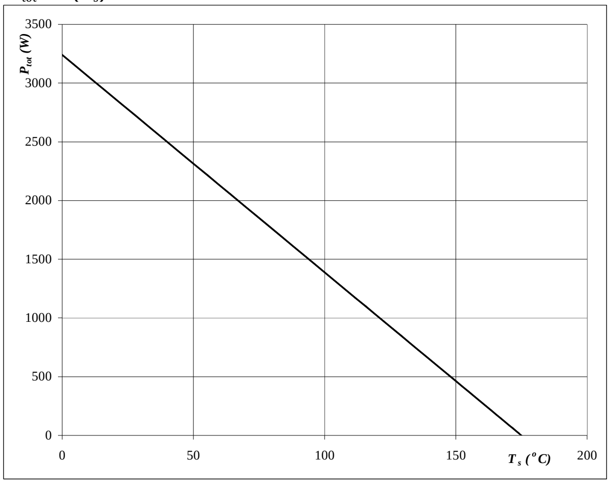
Buck

Buck IGBT and Buck FWD

figure 21.	IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



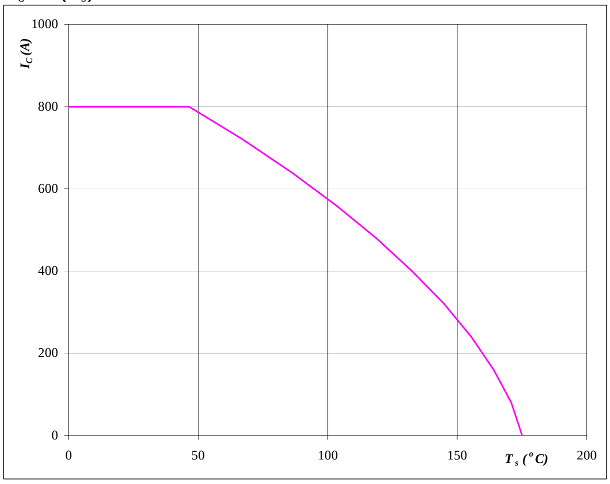
At

T_j = 175 °C

figure 22.	IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

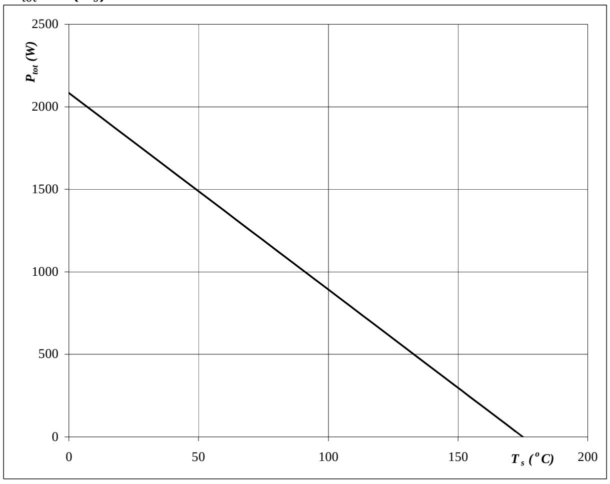
T_j = 175 °C

V_{GE} = 15 V

figure 23.	FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



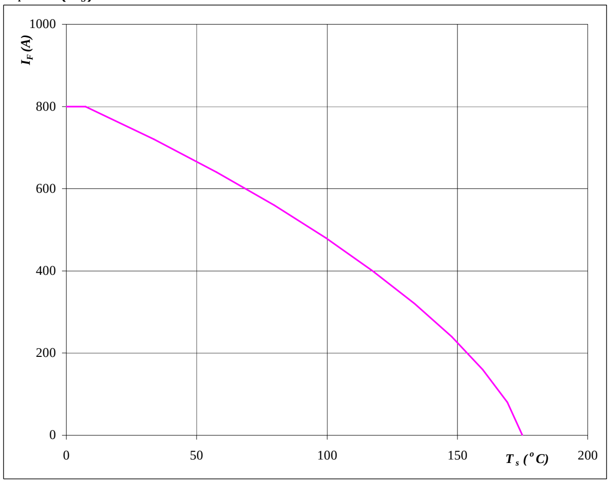
At

T_j = 175 °C

figure 24.	FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

T_j = 175 °C

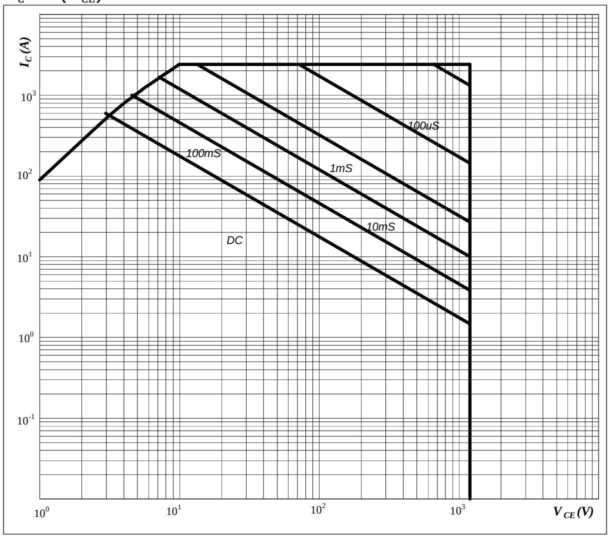
Buck

Buck IGBT and Buck FWD

figure 25. **IGBT**

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



At

D = single pulse

T_s = 80 ºC

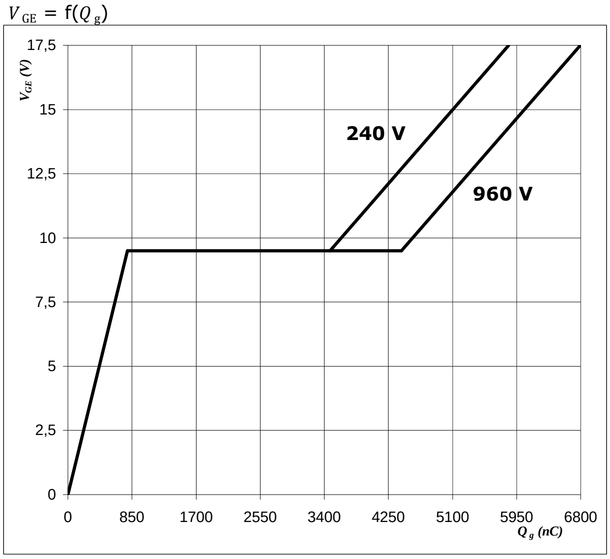
V_{GE} = 15 V

T_j = T_{jmax}

figure 26. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



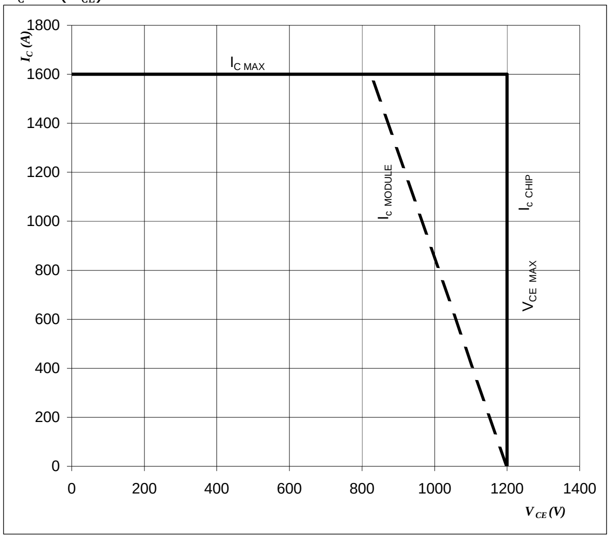
At

I_C = 800 A

figure 27. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = T_{jmax}-25 ºC

$U_{ccminus}$=U_{ccplus}

Switching mode : 3 level switching

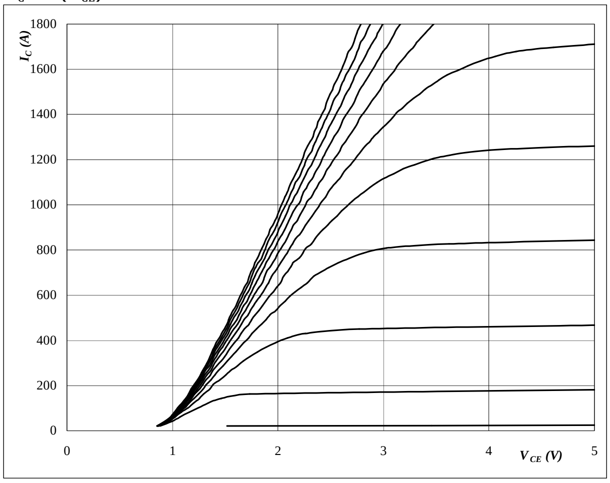
Boost

Boost IGBT and Boost FWD

figure 1.	**IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 350 µs

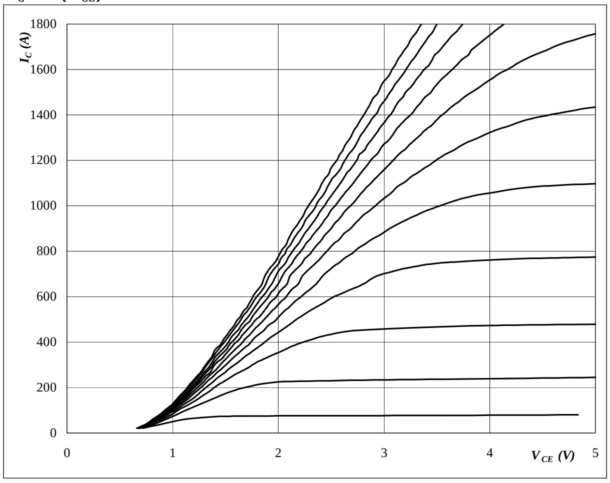
T_j = 25 °C

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 = 350 µs

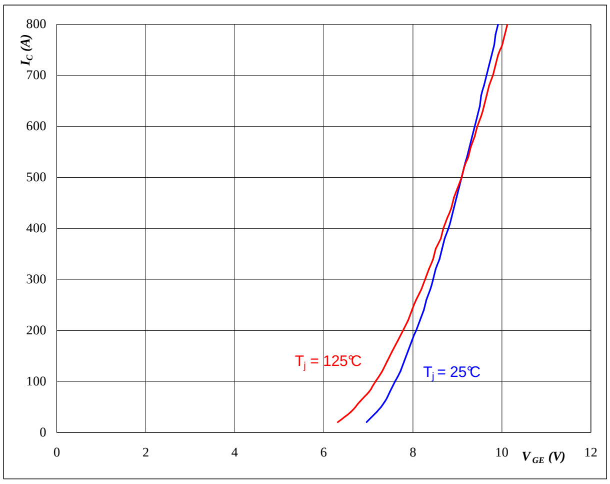
T_j = 125 °C

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

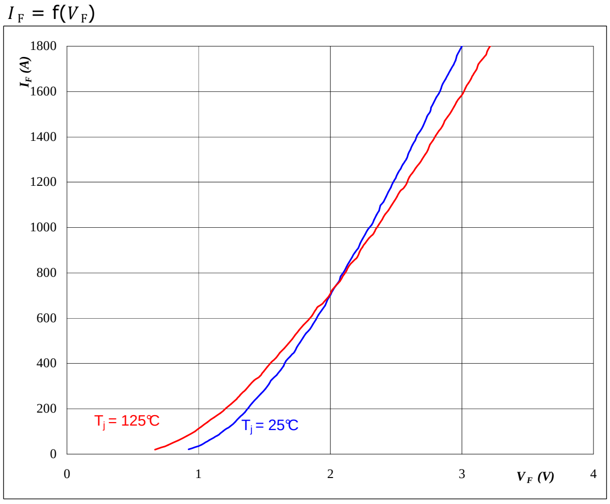
t_p = 350 µs

V_{CE} = 10 V

figure 4.	**FWD**

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



At

t_p = 350 µs

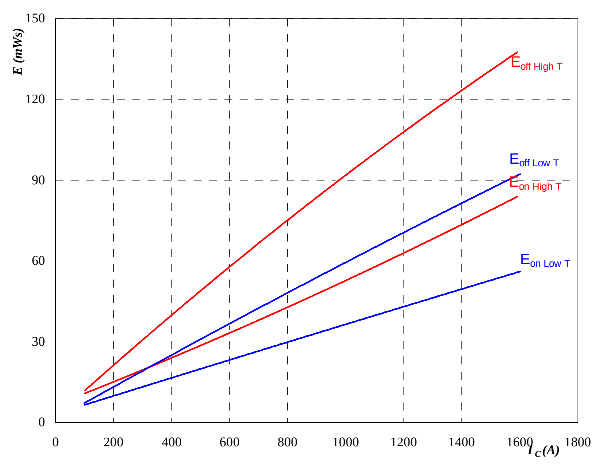
Boost

Boost IGBT and Boost FWD

figure 5. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



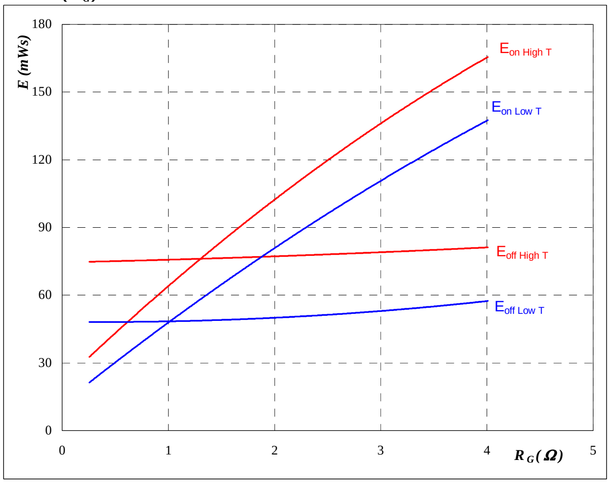
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω
R_{goff} =	0,5	Ω

figure 6. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



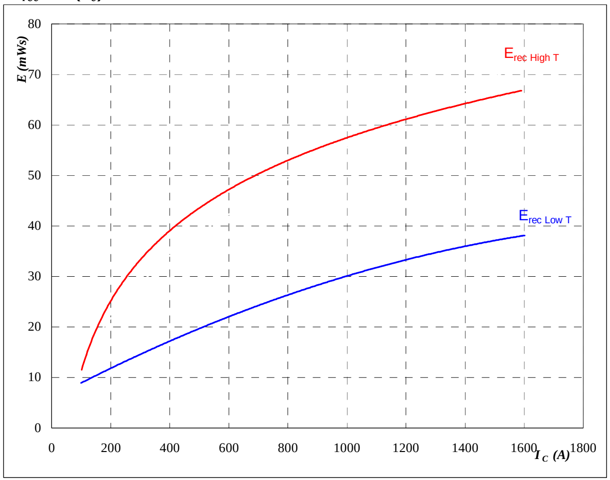
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	796	A

figure 7. **FWD**

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_c)$



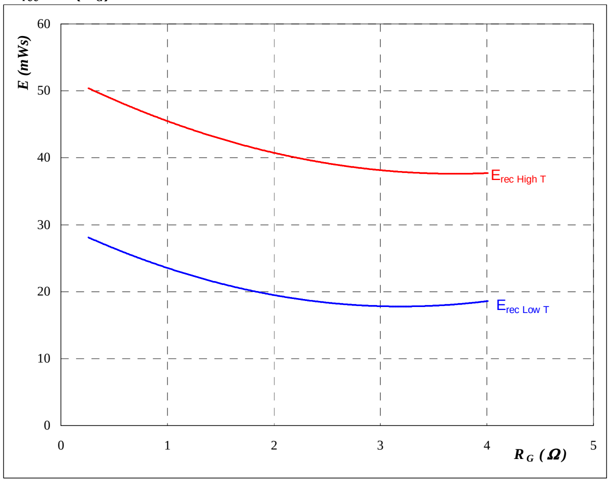
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 8. **FWD**

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	796	A

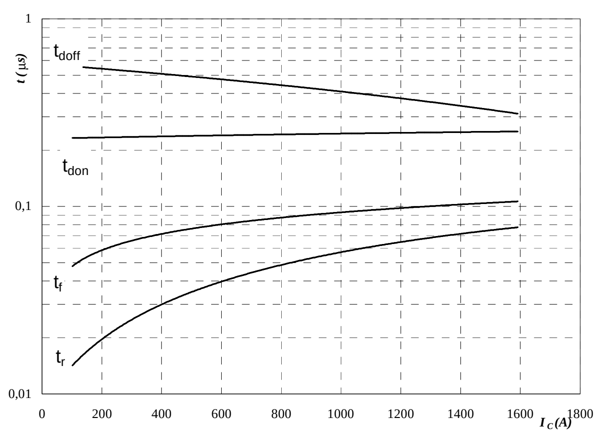
Boost

Boost IGBT and Boost FWD

figure 9.	IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



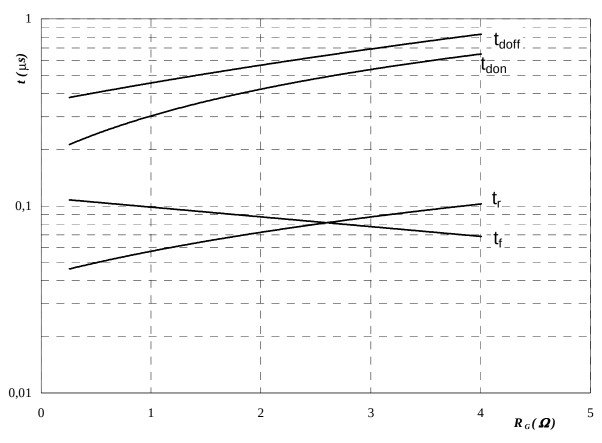
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω
R_{goff} =	0,5	Ω

figure 10.	IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



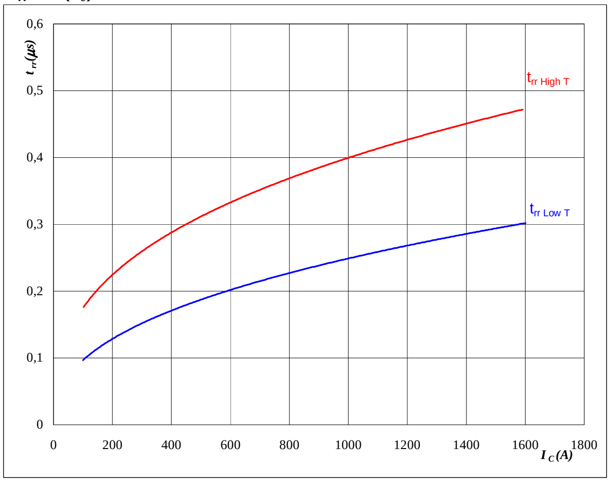
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	796	A

figure 11.	FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_c)$



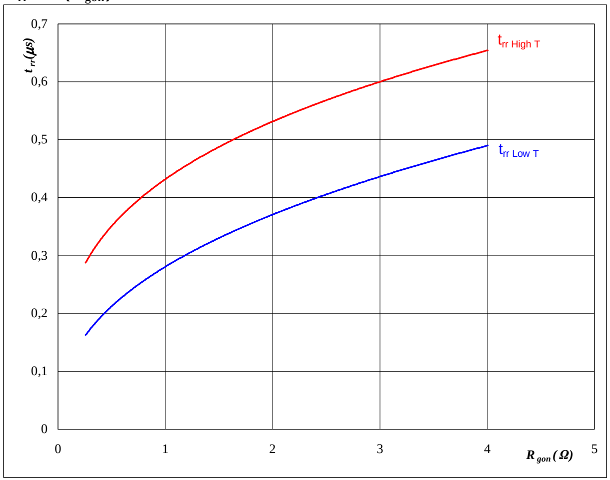
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 12.	FWD

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

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



At

T_j =	25/125	°C
V_R =	600	V
I_F =	796	A
V_{GE} =	±15	V

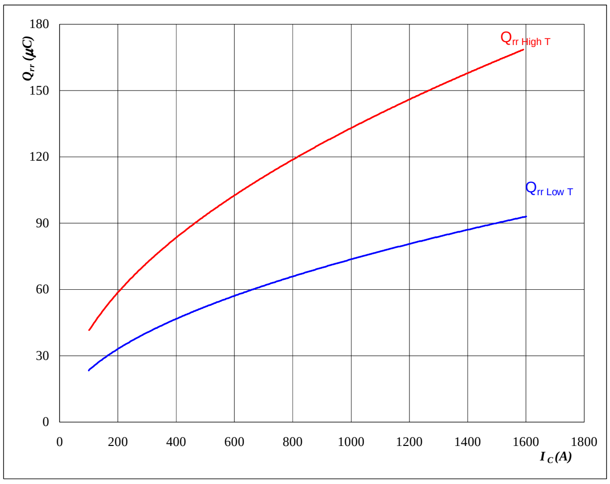
Boost

Boost IGBT and Boost FWD

figure 13.	FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



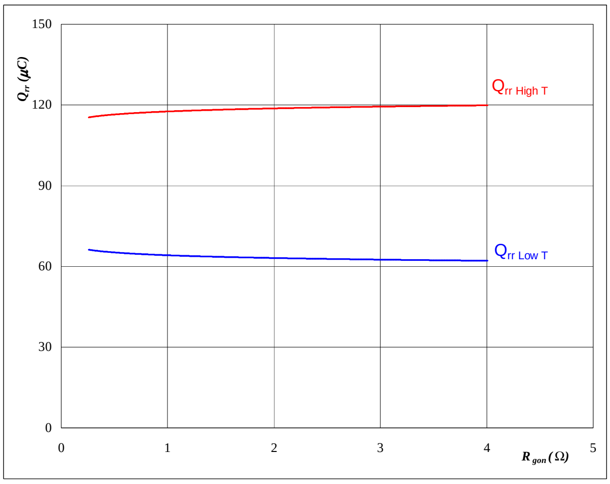
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 14.	FWD

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

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



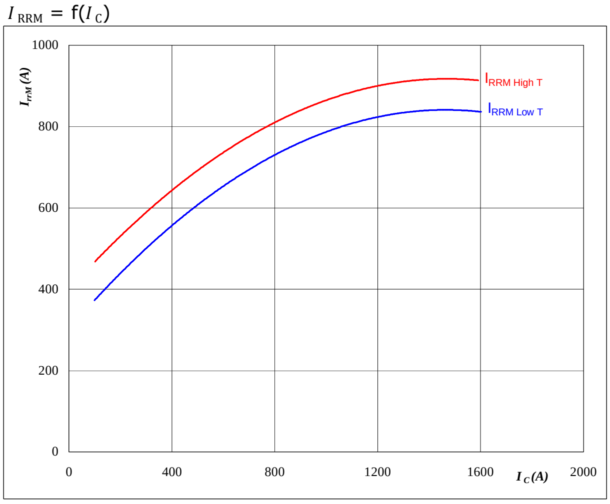
At

T_j =	25/125	°C
V_R =	600	V
I_F =	796	A
V_{GE} =	±15	V

figure 15.	FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



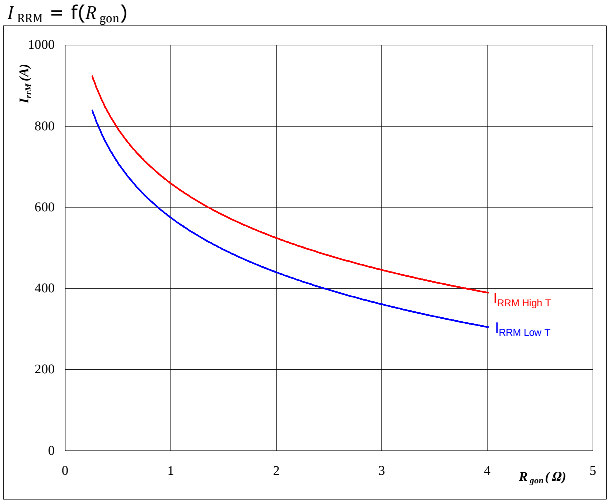
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 16.	FWD

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

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



At

T_j =	25/125	°C
V_R =	600	V
I_F =	796	A
V_{GE} =	±15	V

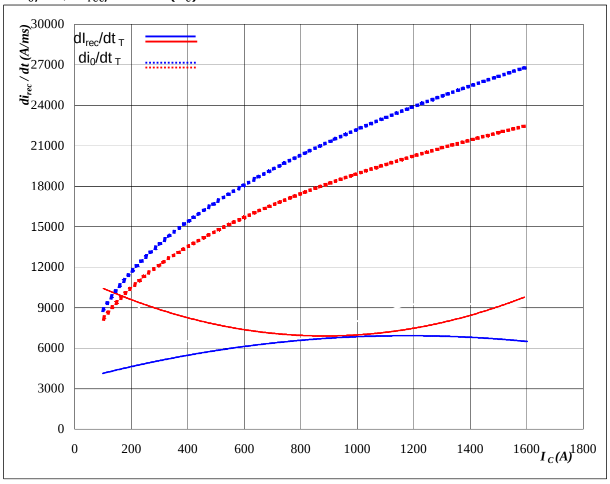
Boost

Boost IGBT and Boost FWD

figure 17.	**FWD**

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

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



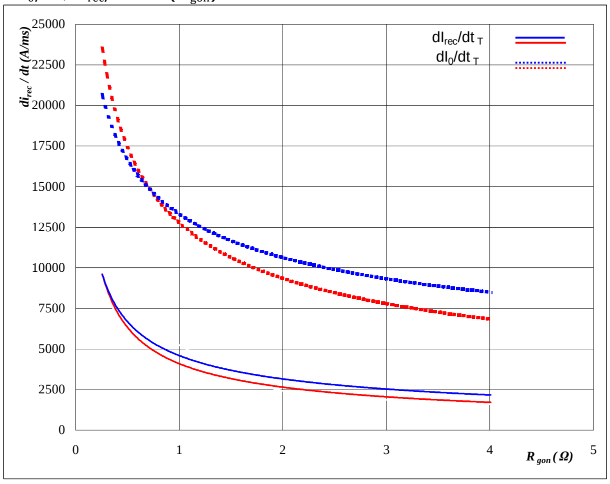
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	0,5	Ω

figure 18.	**FWD**

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

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



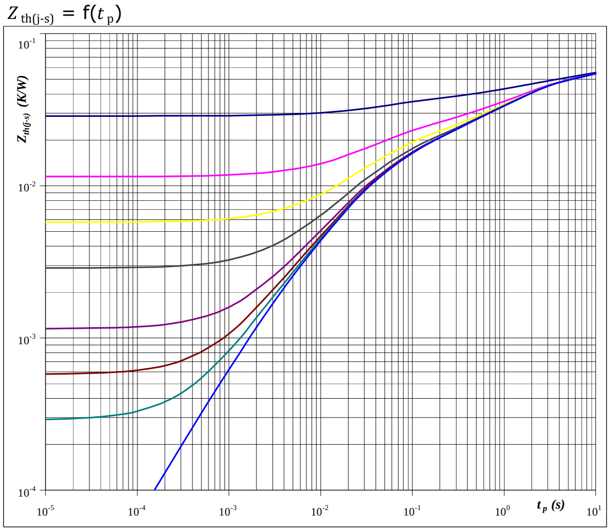
At

T_j =	25/125	°C
V_R =	600	V
I_F =	796	A
V_{GE} =	±15	V

figure 19.	**IGBT**

IGBT transient thermal impedance as a function of pulse width

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



At

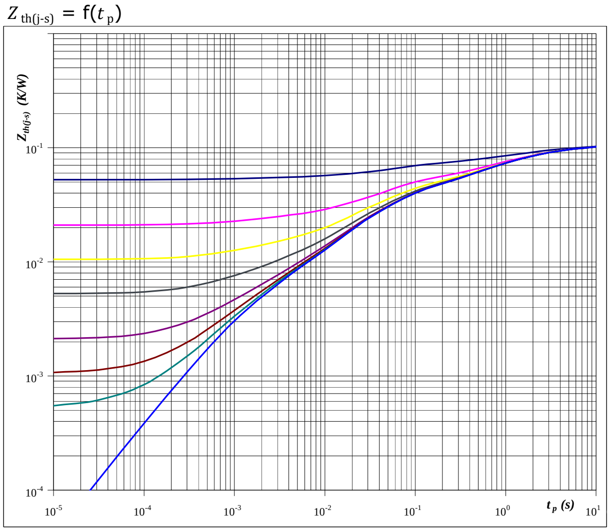
D = t_p / T

$R_{th(j-s)}$ = 0,058 K/W R_{thJC} = 0,038

figure 20.	**FWD**

FWD transient thermal impedance as a function of pulse width

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



At

D = t_p / T

$R_{th(j-s)}$ = 0,105 K/W R_{thJC} = 0,067

IGBT thermal model values

With phase change interface

R (K/W)	Tau (s)
5,78E-03	9,88E+00
2,31E-02	2,75E+00
1,00E-02	6,14E-01
6,38E-03	1,36E-01
9,68E-03	3,02E-02
8,61E-04	3,49E-03

FWD thermal model values

With phase change interface

R (K/W)	Tau (s)
1,01E-02	8,27E+00
3,26E-02	1,88E+00
2,33E-02	4,66E-01
2,66E-02	4,79E-02
6,01E-03	1,19E-02
3,24E-03	1,20E-03

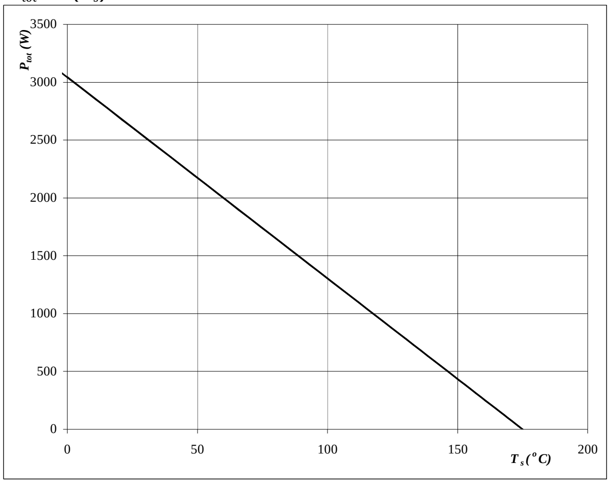
Boost

Boost IGBT and Boost FWD

figure 21.	IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



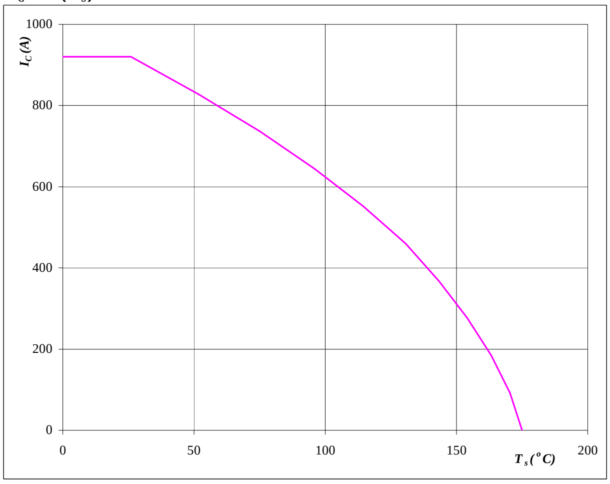
At

T_j = 175 ºC

figure 22.	IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



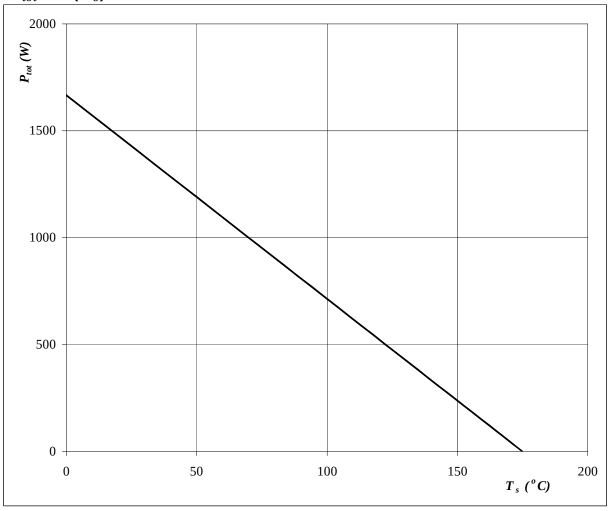
At

T_j = 175 ºC
V_{GE} = 15 V

figure 23.	FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



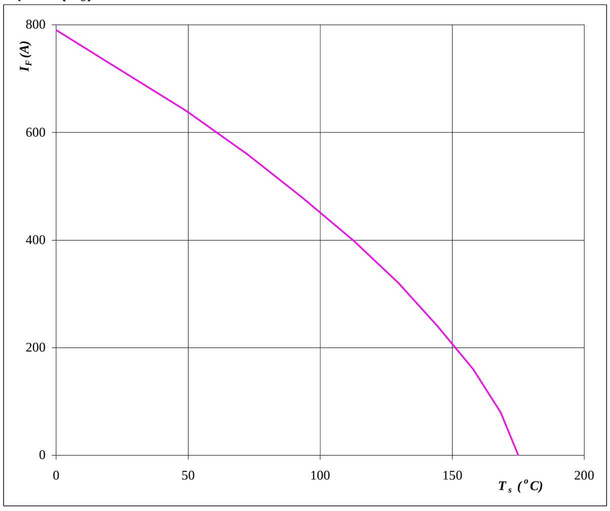
At

T_j = 175 ºC

figure 24.	FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

T_j = 175 ºC

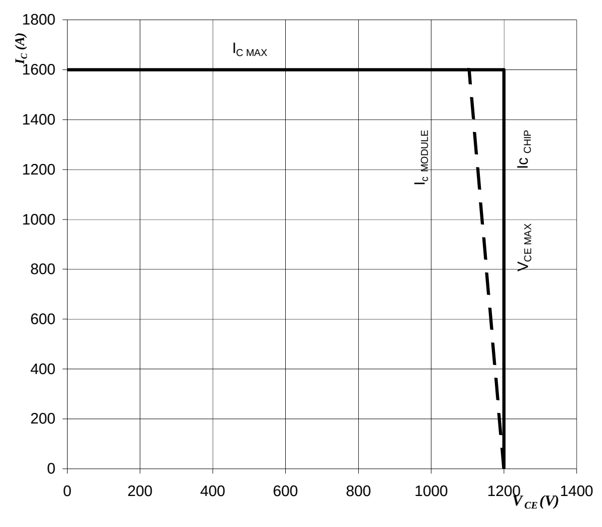
Boost

Boost IGBT

figure 25. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = T_{jmax}-25 ºC

$U_{ccminus}$=U_{ccplus}

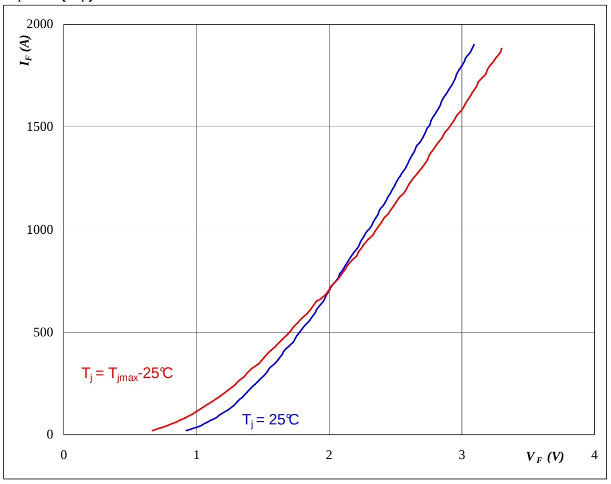
Switching mode : 3 level switching

Boost Inverse Diode

figure 25. **Boost Inverse Diode**

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



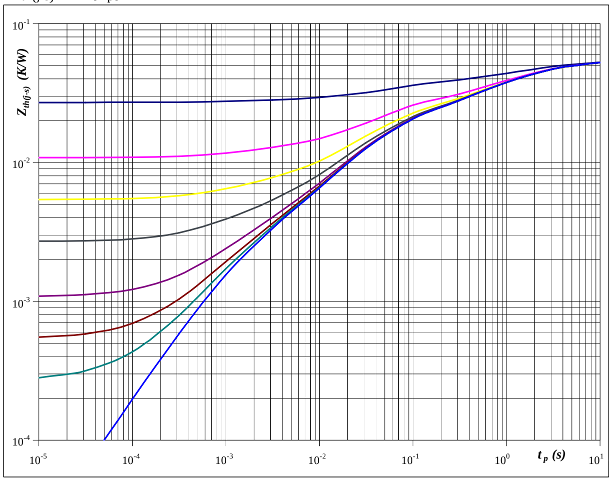
At

t_p = 250 µs

figure 26. **Boost Inverse Diode**

FWD transient thermal impedance as a function of pulse width

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



At

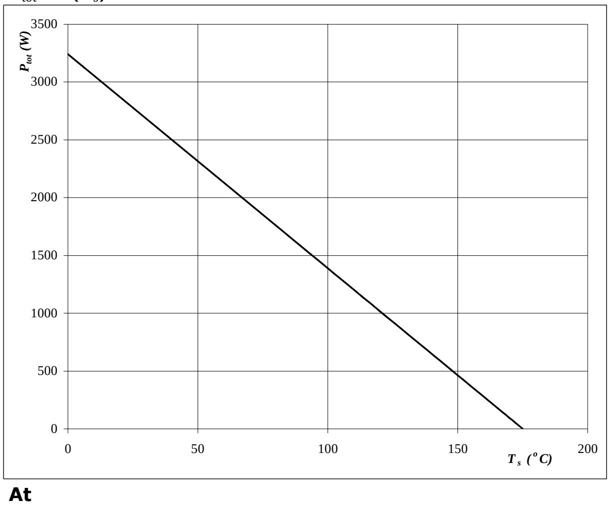
D = t_p / T

$R_{th(j-s)}$ = 0,054 K/W

figure 27. **Boost Inverse Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



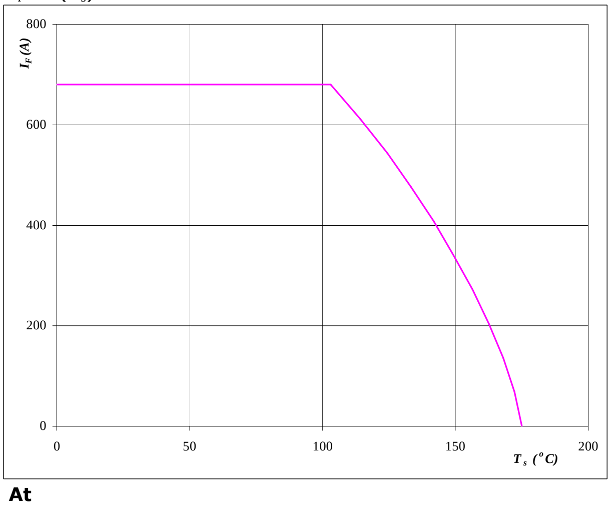
At

T_j = 175 ºC

figure 28. **Boost Inverse Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

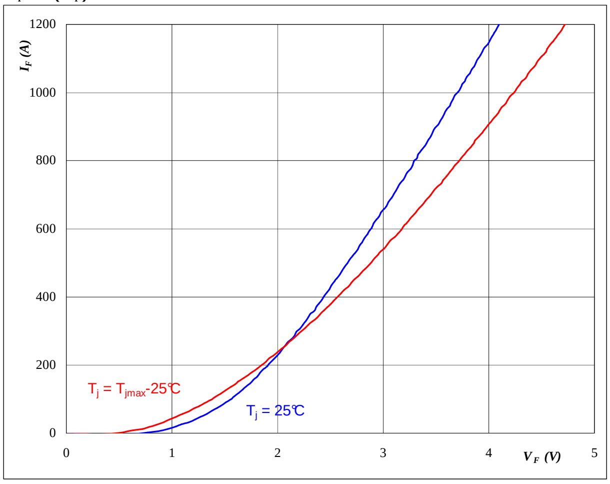
T_j = 175 ºC

Snubber Diode

figure 1. **Snubber Diode**

Typical thyristor forward current as a function of forward voltage

$I_F = f(V_F)$



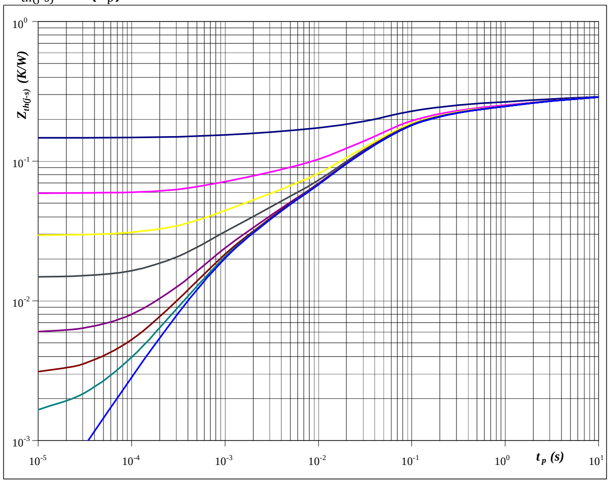
At

t_p = 250 µs

figure 2. **Snubber Diode**

Thyristor transient thermal impedance as a function of pulse width

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



At

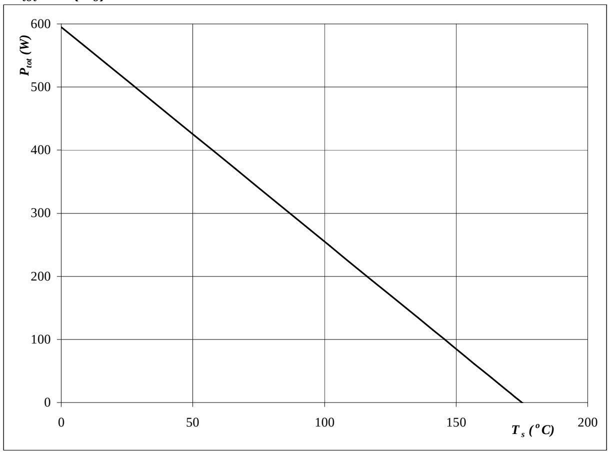
D = t_p / T

$R_{th(j-s)}$ = 0,294 K/W

figure 3. **Snubber Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



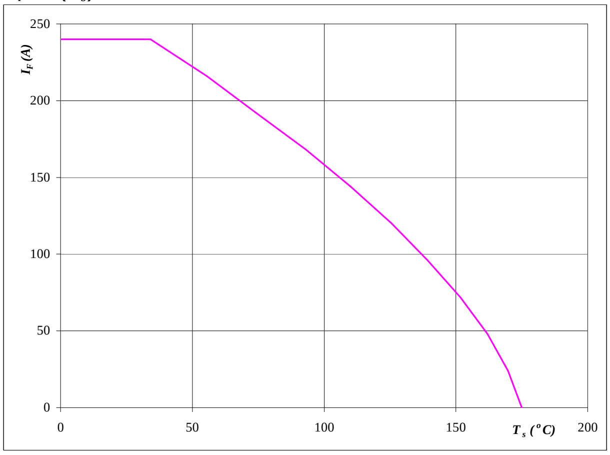
At

T_j = 175 ºC

figure 4. **Snubber Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

T_j = 175 ºC

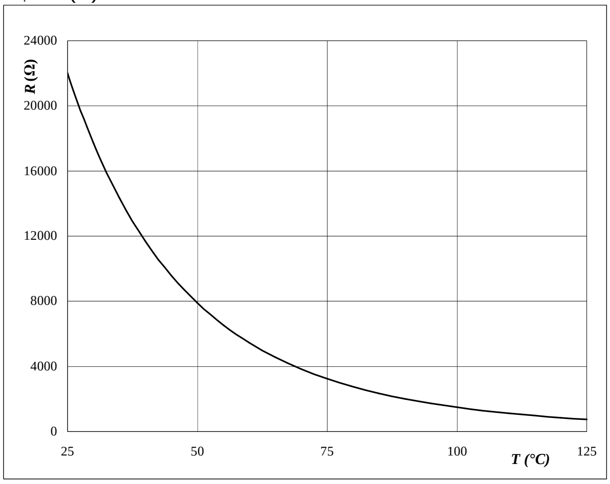
Thermistor

Ω

figure 1.	Thermistor

Typical NTC characteristic as a function of temperature

$R_T = f(T)$



Buck switching definitions

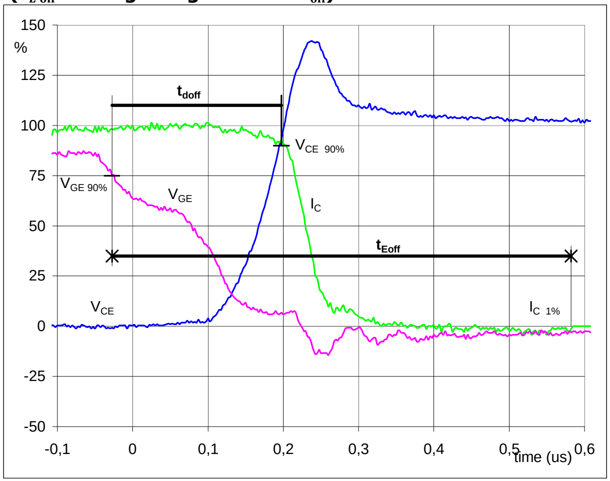
General conditions

T_j	=	125 °C
R_{gon}	=	0,5 Ω
R_{goff}	=	0,5 Ω

Test setup inductance: 9nH

figure 1. **IGBT**

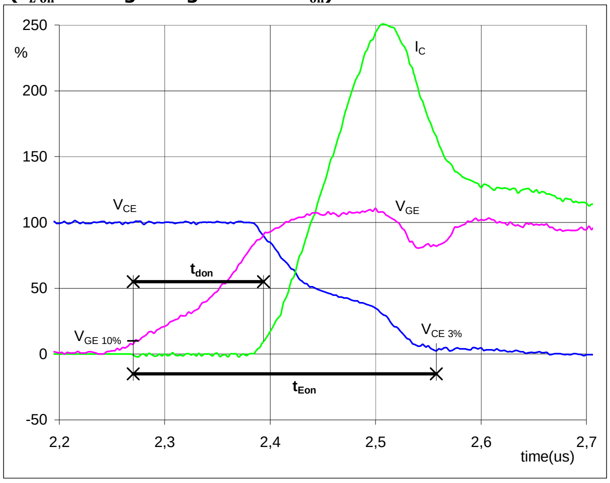
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\ off}$ = integrating time for E_{off})



V_{GE} (0%) =	-8	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	804	A
t_{doff} =	0,23	μs
$t_{E\ off}$ =	0,61	μs

figure 2. **IGBT**

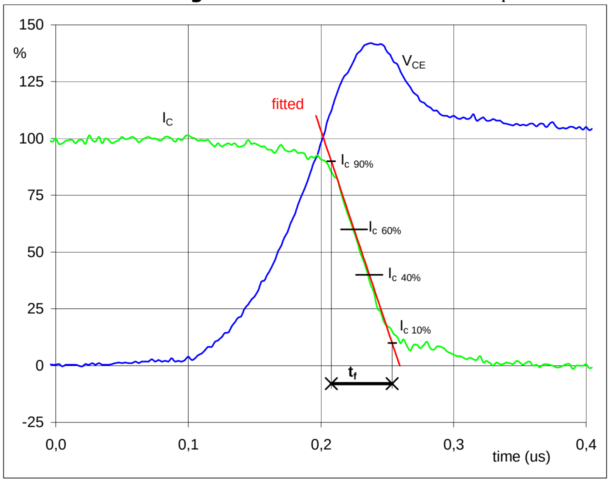
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\ on}$ = integrating time for E_{on})



V_{GE} (0%) =	-8	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	804	A
t_{don} =	0,10	μs
$t_{E\ on}$ =	0,29	μs

figure 3. **IGBT**

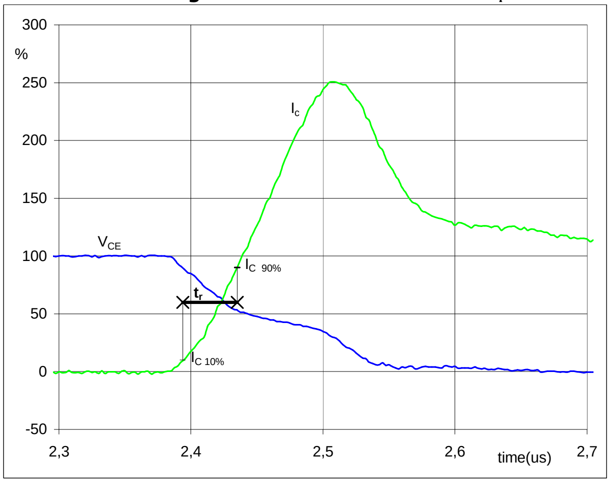
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	804	A
t_f =	0,046	μs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

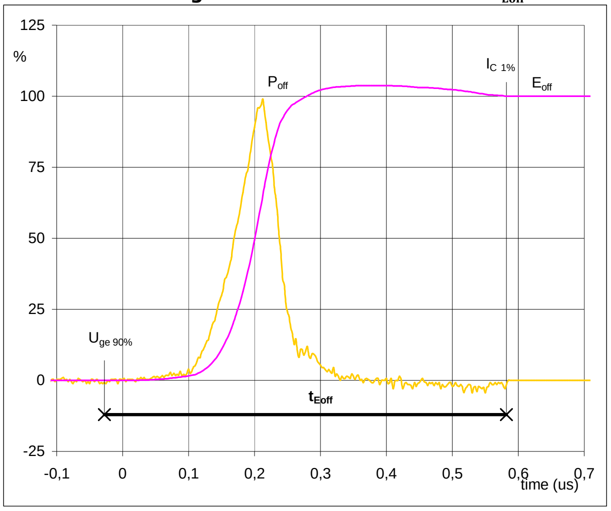


V_C (100%) =	600	V
I_C (100%) =	804	A
t_r =	0,04	μs

Buck switching definitions

figure 5. **IGBT**

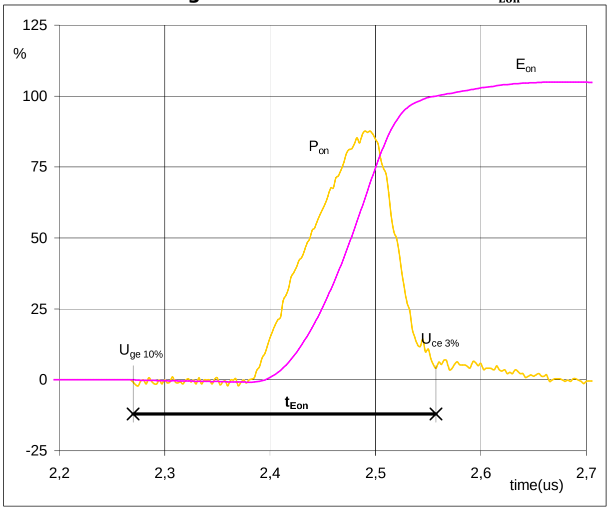
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	483	kW
E_{off} (100%) =	38,21	mJ
$t_{E\,off}$ =	0,58	µs

figure 6. **IGBT**

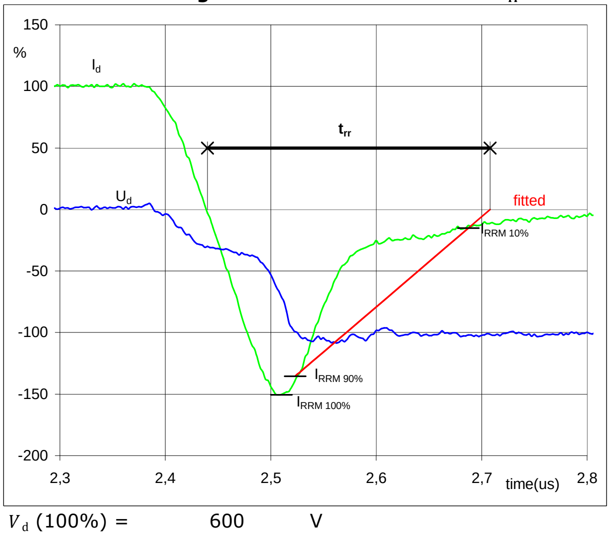
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	483	kW
E_{on} (100%) =	13,39	mJ
$t_{E\,on}$ =	0,38	µs

figure 7. **FWD**

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

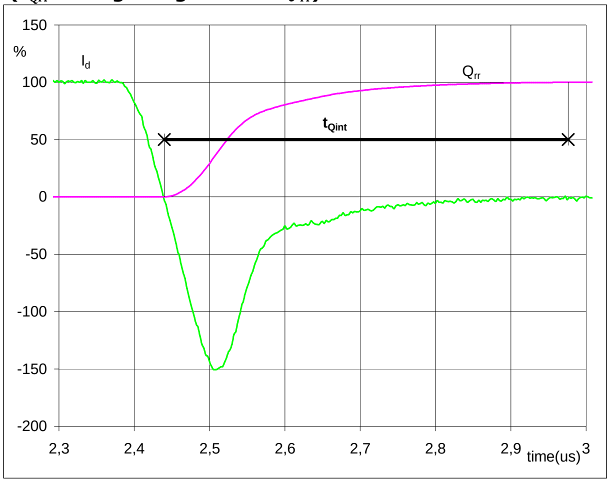


V_d (100%) =	600	V
I_d (100%) =	804	A
I_{RRM} (100%) =	-1215	A
t_{rr} =	0,26	µs

Buck switching definitions

figure 8. **FWD**

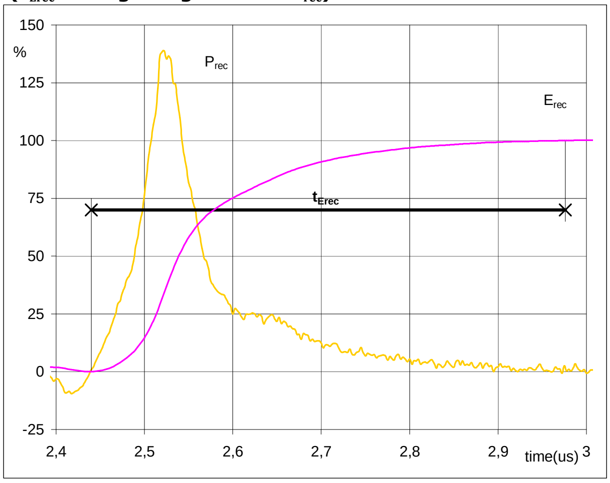
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



I_d (100%) =	804	A
Q_{rr} (100%) =	132,40	μC
t_{Qint} =	0,33	μs

figure 9. **FWD**

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



P_{rec} (100%) =	482,56	kW
E_{rec} (100%) =	63,38	mJ
$t_{E\,rec}$ =	0,33	μs

Boost switching definitions

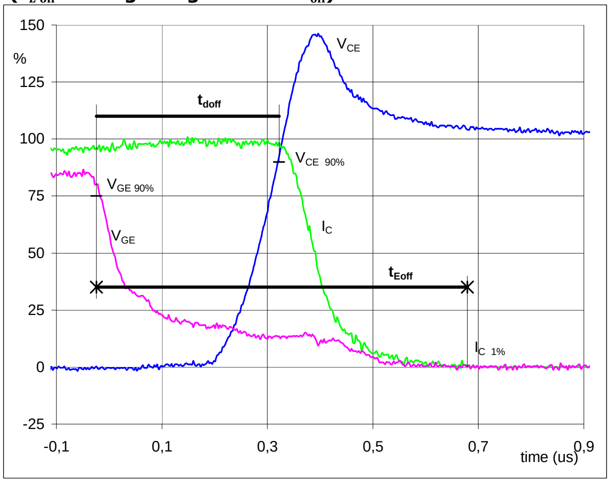
General conditions

T_j	=	125 °C
R_{gon}	=	0,5 Ω
R_{goff}	=	0,5 Ω

Test setup inductance: 9nH

figure 1. **Boost IGBT**

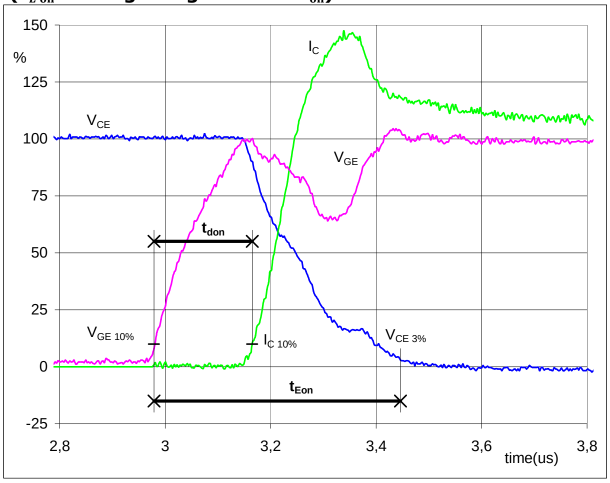
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-8	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	827	A
t_{doff} =	0,34	μs
$t_{E\,off}$ =	0,70	μs

figure 2. **Boost IGBT**

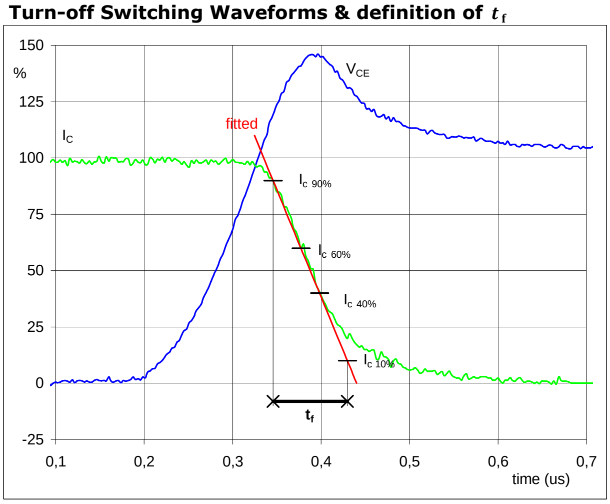
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-8	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	827	A
t_{don} =	0,18	μs
$t_{E\,on}$ =	0,47	μs

figure 3. **Boost IGBT**

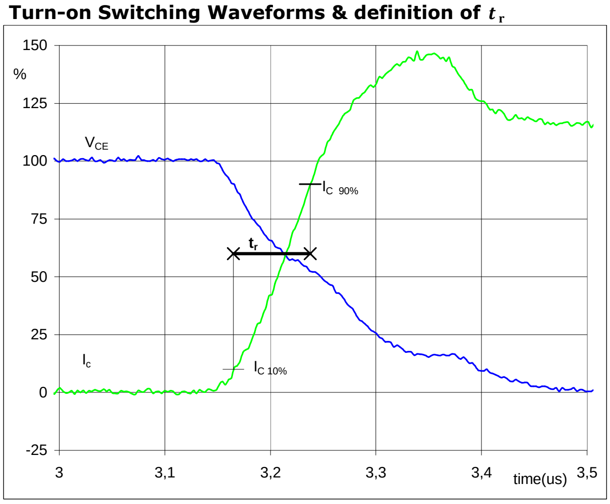
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	827	A
t_f =	0,079	μs

figure 4. **Boost IGBT**

Turn-on Switching Waveforms & definition of t_r

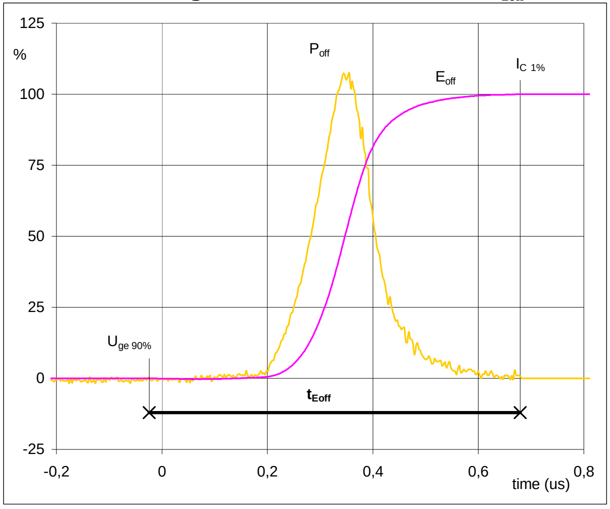


V_C (100%) =	600	V
I_C (100%) =	827	A
t_r =	0,072	μs

Boost switching definitions

figure 5.	**Boost IGBT**

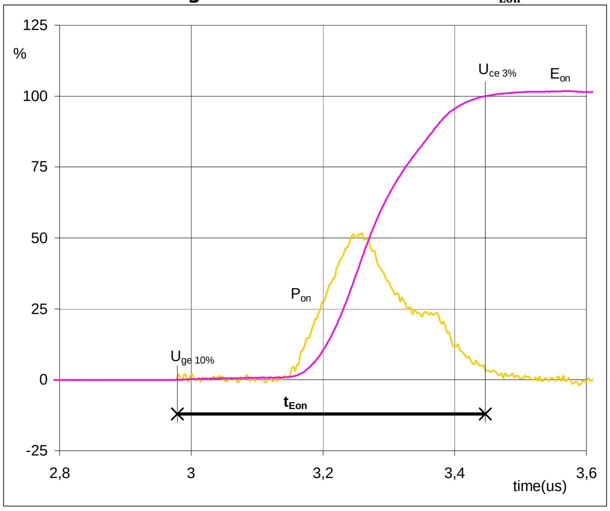
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	496	kW
E_{off} (100%) =	75	mJ
$t_{E\ off}$ =	0,70	μs

figure 6.	**Boost IGBT**

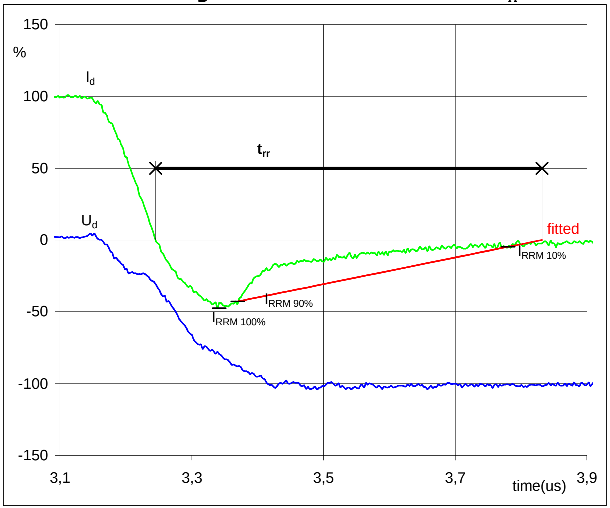
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	496	kW
E_{on} (100%) =	40	mJ
$t_{E\ on}$ =	0,47	μs

figure 7.	**Boost FWD**

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

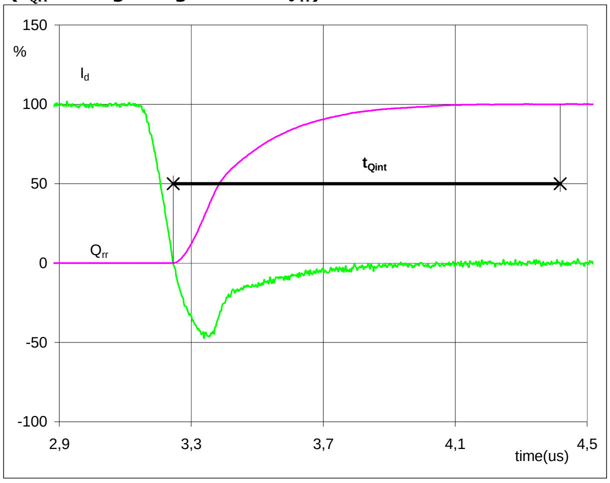


V_d (100%) =	600	V
I_d (100%) =	827	A
I_{RRM} (100%) =	-396	A
t_{rr} =	0,47	μs

Boost switching definitions

figure 8.	Boost FWD

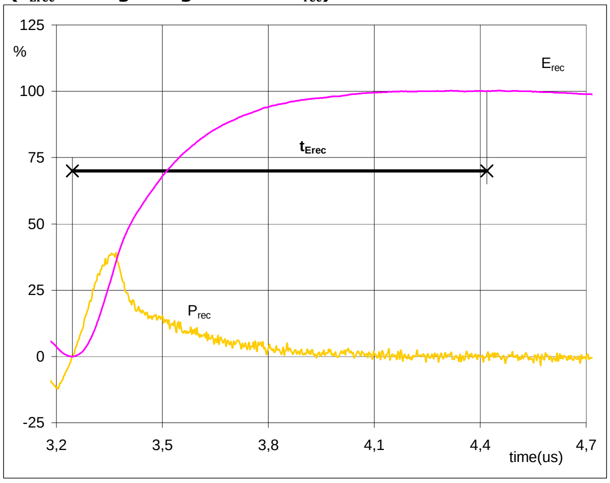
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



I_d (100%) =	827	A
Q_{rr} (100%) =	83,52	µC
t_{Qint} =	1,17	µs

figure 9.	Boost FWD

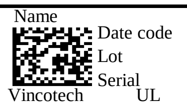
Turn-on Switching Waveforms & definition of t_{Erec}
(t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	496,41	kW
E_{rec} (100%) =	44,13	mJ
$t_{E\,rec}$ =	1,17	µs

Ordering Code & Marking

Version	Ordering Code
without thermal paste	70-W424NIA800SH-M800F
with thermal paste	70-W424NIA800SH-M800F-/3/



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

Outline

Pin table [mm]

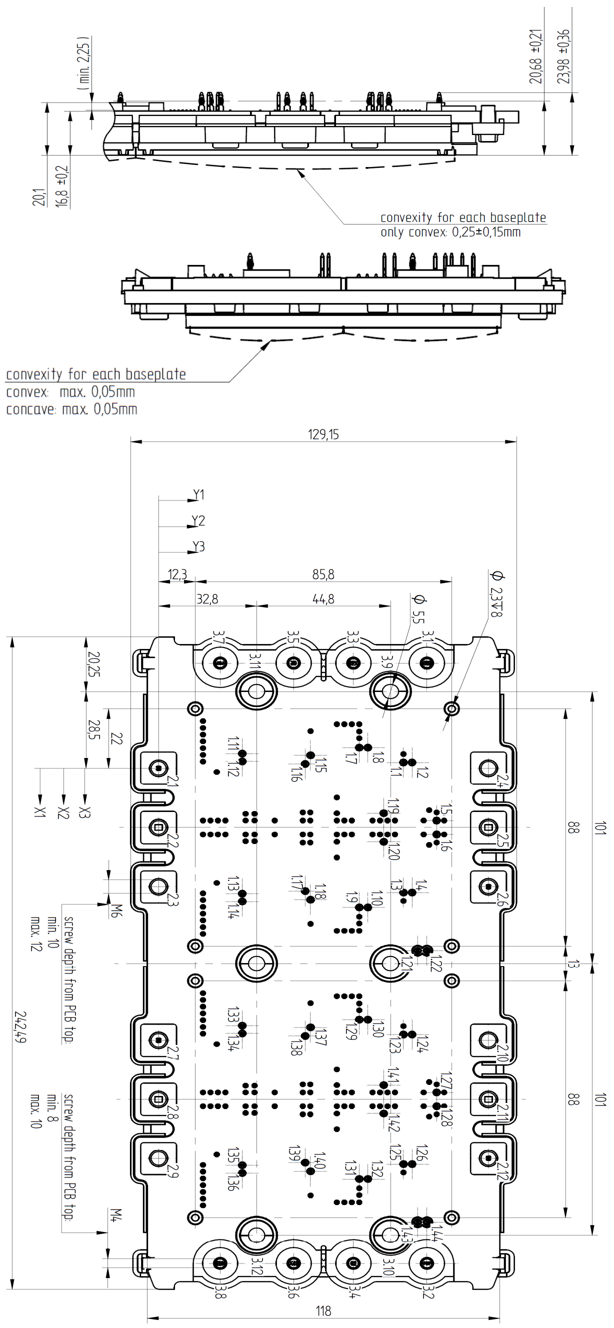
Pin	X	Y	Function
1.1	-2,15	81,95	S11-a-1
1.2	-2,15	84,85	G11-a-1
1.3	46,15	81,95	S11-a-2
1.4	46,15	84,85	G11-a-2
1.5	19,45	93,05	DC+ (desat)
1.6	24,55	93,05	DC+ (desat)
1.7	-7,65	67,15	S13-a-1
1.8	-7,65	70,05	G13-a-1
1.9	51,65	67,15	S13-a-2
1.10	51,65	70,05	G13-a-2
1.11	-5,45	28	S14-a-1
1.12	-2,55	28	G14-a-1
1.13	46,55	28	G14-a-2
1.14	49,45	28	S14-a-2
1.15	-4,8	50,85	G12-a-1
1.16	-1,6	49,05	S12-a-1
1.17	45,6	49,05	S12-a-2
1.18	48,8	50,85	G12-a-2
1.19	16,75	75,35	GND (desat)
1.20	27,25	75,35	GND (desat)
1.21	67,65	86,7	Therm12
1.22	67,65	89,8	Therm11
1.23	98,85	81,95	S11-b-1
1.24	98,85	84,85	G11-b-1
1.25	147,15	81,95	S11-b-2
1.26	147,15	84,85	G11-b-2
1.27	120,45	93,05	DC+ (desat)
1.28	125,55	93,05	DC+ (desat)
1.29	93,35	67,15	S13-b-1
1.30	93,35	70,05	G13-b-1
1.31	152,65	67,15	S13-b-2
1.32	152,65	70,05	G13-b-2
1.33	95,55	28	S14-b-1
1.34	98,45	28	G14-b-1
1.35	147,55	28	G14-b-2
1.36	150,45	28	S14-b-2
1.37	96,2	50,85	G12-b-1
1.38	99,4	49,05	S12-b-1
1.39	146,6	49,05	S12-b-2
1.40	149,8	50,85	G12-b-2
1.41	117,75	75,35	GND (desat)
1.42	128,25	75,35	GND (desat)
1.43	168,65	86,7	Therm22
1.44	168,65	89,8	Therm21

Power connections

M6 screw	X2	Y2	Function
2.1	0	0	Phase
2.2	22	0	Phase
2.3	44	0	Phase
2.4	0	110,4	DC+
2.5	22	110,4	GND
2.6	44	110,4	DC-
2.7	101	0	Phase
2.8	123	0	Phase
2.9	145	0,0	Phase
2.10	101	110,4	DC+
2.11	123	110,4	GND
2.12	145	110,4	DC-

Low current connections

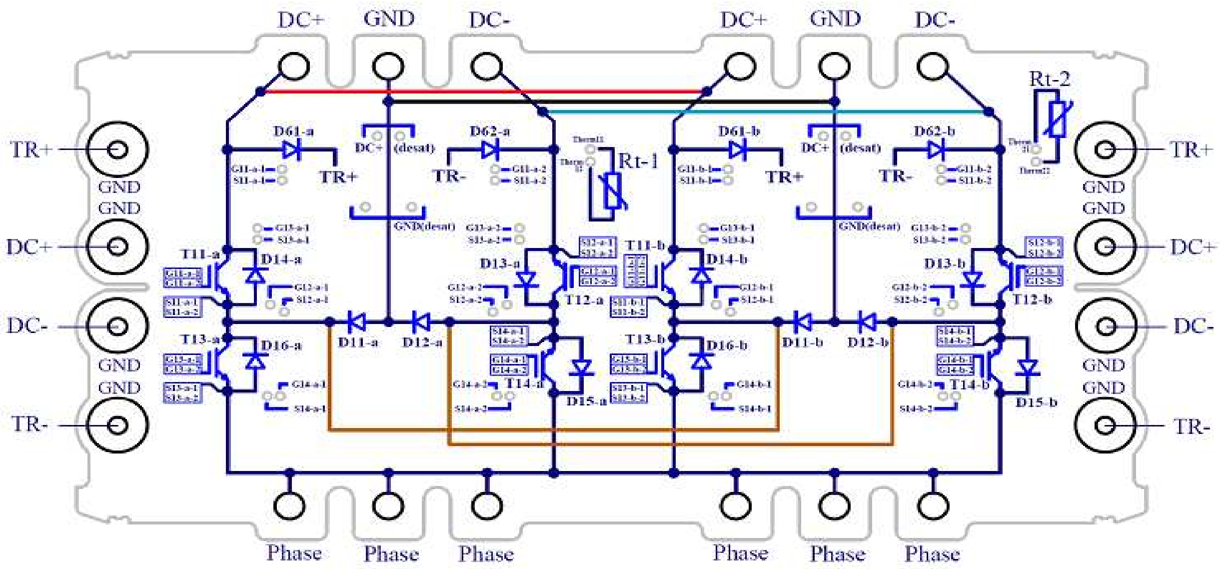
M4 screw	X3	Y3	Function
3.1	-39,1	89,8	TR+
3.2	184,1	89,8	TR+
3.3	-39,1	65,2	DC+
3.4	184,1	65,2	DC+
3.5	-39,1	45,2	DC-
3.6	184,1	45,2	DC-
3.7	-39,1	20,6	TR-
3.8	184,1	20,6	TR-
3.9	-39,1	89,8	GND
3.10	184,1	89,8	GND
3.11	-39,1	45,2	GND
3.12	184,1	45,2	GND



Tolerance of pinpositions: ±0,5mm at the end of pins

PCB holes and connection parameters of pins see in the handling instruction document

Pinout



NOTE: Driver pins for parallel devices are not connected inside the module!
Gx-1 to Gx-2 and Ex-1 to Ex2 shall be connected on customer PCB!
Where x = 1 to 4

Identification

ID	Component	Voltage	Current	Function	Comment
T11 , T12	IGBT	1200 V	800 A	Buck IGBT	Parallel devices with separate control. Values apply to complete device.
D11 , D12	FWD	1200 V	800 A	Buck Diode	Parallel devices with separate control. Values apply to complete device.
T13 , T14	IGBT	1200 V	800 A	Boost IGBT	Parallel devices with separate control. Values apply to complete device.
D13 , D14	FWD	1200 V	600 A	Boost Diode	Parallel devices with separate control. Values apply to complete device.
D15 , D16	Diode	1200 V	60 A	Boost Inverse Diode	Parallel devices with separate control. Values apply to complete device.
D61 , D62	Diode	1200 V	100 A	Snubber Diode	Parallel devices with separate control. Values apply to complete device.
Rt-1 , Rt-2	NTC			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	**4**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for VINco X8 packages see vincotech.com website.

Package data
Package data for VINco X8 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
70-W424NIA800SH-M800F-D5-14	09 Jan. 2018	Gate charges corrected	4 , 5 , 13