VINcoNPC X12 — **1500 V / 1200 A**

Features

- 1500V NPC-topology
- Low inductive
- High power screw interface

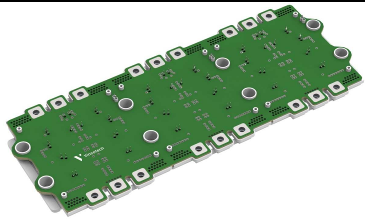
Target Applications

- Solar inverter
- Wind Power
- Motor Drive

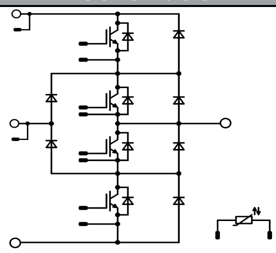
Types

- 70-W624N3A1K2SC-L400FP

VINco X12 housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Buck Switch					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	940	A
Pulsed collector current	I_{CRM}	t_p limited by T_{jmax}		3600	A
Turn off safe operating area		V_{CE} ≤ 1200V, $T_j \le T_{op}$ max		2400	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	2470	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					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	744	A
Repetitive peak forward current	I_{FRM}	t_p=10ms, sin 180°		2400	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1490	W
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Switch					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	922	A
Pulsed collector current	I_{CRM}	t_p limited by T_{jmax}		3600	A
Turn off safe operating area		V_{CE} ≤ 1200V, T_j ≤ T_{op} max		2400	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	2192	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					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	634	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1800	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1069	W
Maximum Junction Temperature	T_{jmax}			175	°C
Boost Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	648	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1800	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1069	W
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(T_{jmax} - 25)	°C
Maximum allowed PCB temperature	T_{PCB}			125	°C
Insulation Properties					
Insulation voltage	V_{isol}	t = 2 s	DC Test Voltage*	4000	V
		t = 1 min	AC Voltage	2500	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm
Competative 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	
Buck Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0408	25	5,2	5,8	6,4	V
Collector-emitter saturation voltage	V_{CEsat}		15		1200	25 125	1,7	2,37 2,78	2,4	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		25			0,024	mA
Gate-emitter leakage current	I_{GES}		20	0		25			2880	nA
Integrated Gate resistor	R_{gint}							0,166667		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 0,42 Ω R_{gon} = 0,42 Ω	-10/+15	600	1200	25 125		113 115		ns
Rise time	t_r					25 125		43 45		
Turn-off delay time	$t_{d(off)}$					25 125		183 229		
Fall time	t_f					25 125		38 68		
Turn-on energy loss per pulse	E_{on}					25 125		44,08 48,91		mWs
Turn-off energy loss per pulse	E_{off}					25 125		49,18 86,78		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		66480		pF
Output capacitance	C_{oss}							4560		
Reverse transfer capacitance	C_{rss}							3840		
Gate charge	Q_G		±15	960	960	25		9120		nC
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,038		K/W
Buck Diode										
Diode forward voltage	V_F				1200	25 125		2,34 2,38	2,52	V
Reverse leakage current	I_R			1200		25			1440	µA
Peak reverse recovery current	I_{RRM}	R_{gon} = 0,42 Ω	-10/+15	600	1200	25 125		1075 1355		A
Reverse recovery time	t_{rr}					25 125		169 214		ns
Reverse recovered charge	Q_{rr}					25 125		73,24 136,71		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		26252 24254		A/µs
Reverse recovered energy	E_{rec}					25 125		28,02 61,41		mWs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,06		K/W

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 Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0456	25	5	5,80	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		1200	25 125		1,91 2,14	2,05	V
Collector-emitter cut-off incl diode	I_{CES}		0	1200		25			0,0156	mA
Gate-emitter leakage current	I_{GES}		20	0		25			1440	nA
Integrated Gate resistor	R_{gint}					25		0,625		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 0,42 Ω R_{gon} = 0,42 Ω	-10/+15	600	1200			158 174		ns
Rise time	t_r					25 125		64 66		ns
Turn-off delay time	$t_{d(off)}$					25 125		273 342		ns
Fall time	t_f					25 125		57 92		ns
Turn-on energy loss per pulse	E_{on}					25 125		84,6 104,7		mWs
Turn-off energy loss per pulse	E_{off}					25 125		68,3 120,0		mWs
Input capacitance	C_{ies}	f = 1 MHz	0	25	1200	25		73800		pF
Output capacitance	C_{oss}							4860		pF
Reverse transfer capacitance	C_{rss}							4140		pF
Gate charge	Q_G		15	960	1200	25		9600		nC
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,04		K/W
Boost Inverse Diode										
Diode forward voltage	V_F				900	25 125	1,35	1,90 1,84	2,05	V
Reverse leakage current	I_R					25			168	µA
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,09		K/W
Boost Diode										
Diode forward voltage	V_F				900	25 125	1,35	1,90 1,84	2,05	V
Reverse leakage current	I_r			1200		25			168	µA
Peak reverse recovery current	I_{RRM}	R_{gon} = 0,42 Ω	-10/+15	600	1200	25 125		696 903		A
Reverse recovery time	t_{rr}					25 125		296 451		ns
Reverse recovered charge	Q_{rr}					25 125		89 173		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		5538 4822		A/µs
Reverse recovery energy	E_{rec}					125 125		31,66 69,81		mWs
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,09		K/W

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} = 1484 Ω				100	-5		+5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1%				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1%				25		4000		K
Vincotech NTC Reference									I	
Module Properties										
Module inductance (from chips to PCB)	$L_{sCE\ C\text{-}PCB}$	Buck Boost						5 9		nH
Weight	m								1930	g

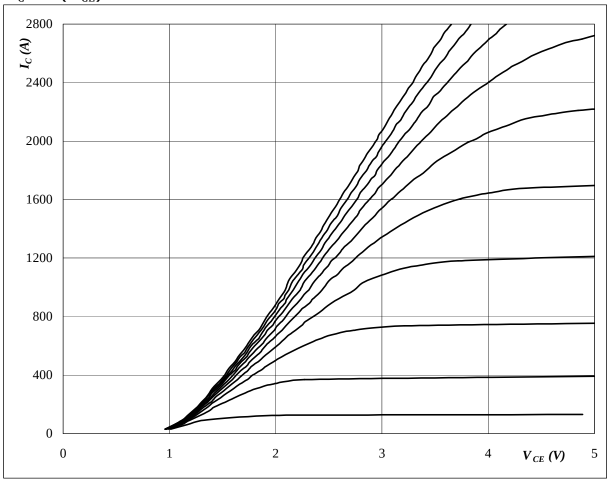
Buck

Buck IGBT and Buck FWD

figure 1.	**IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 350 µs

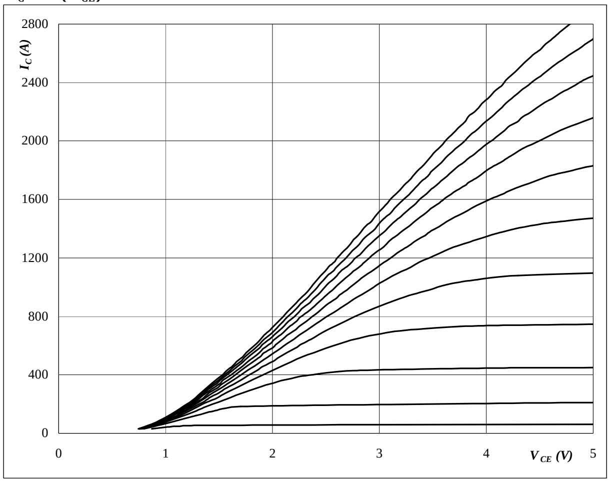
T_j = 25 °C

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

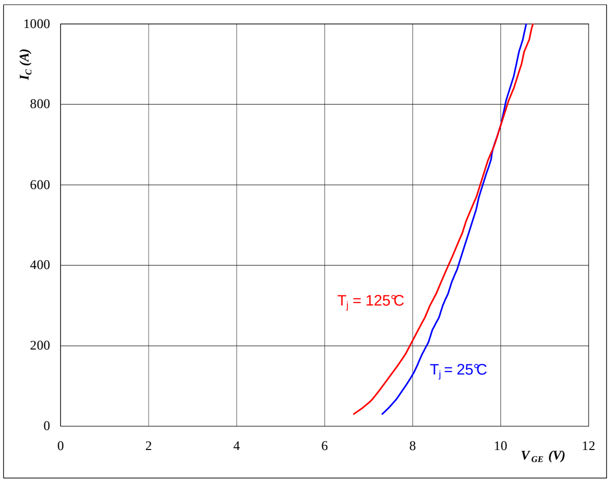
T_j = 125 °C

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

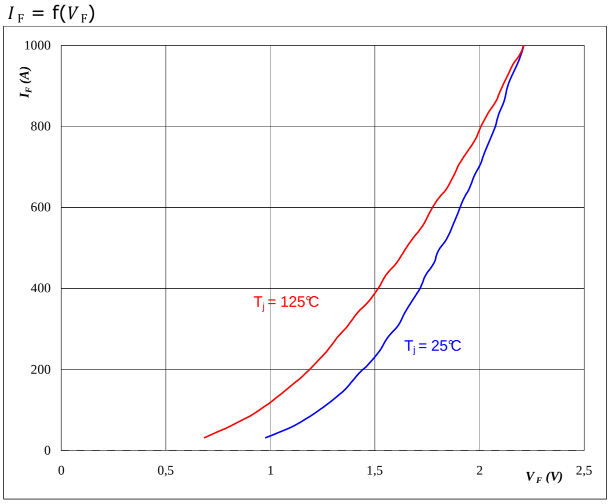
t_p = 350 µs

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

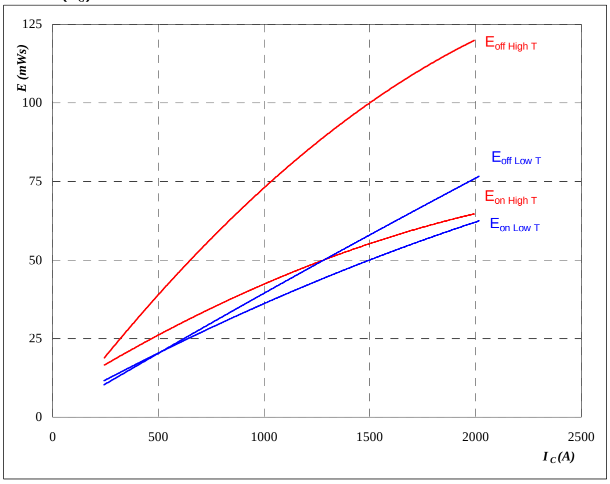
Buck

Buck IGBT and Buck FWD

figure 5. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



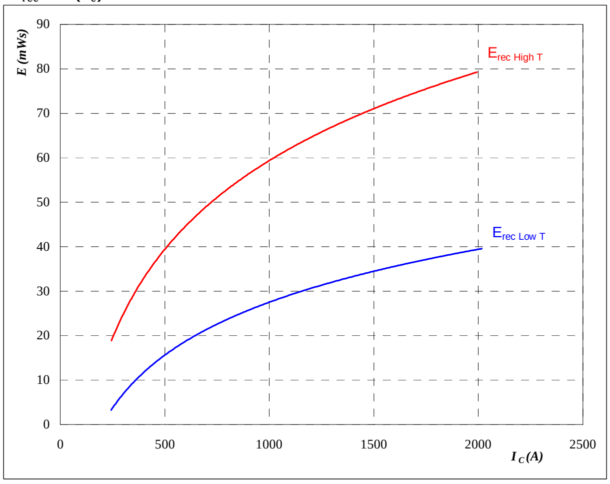
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	-10/+15	V
R_{gon} =	0,42	Ω
R_{goff} =	0,42	Ω

figure 6. **FWD**

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_c)$



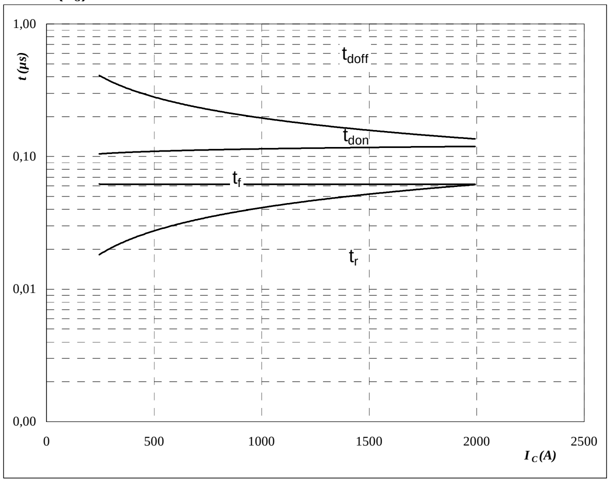
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	-10/+15	V
R_{gon} =	0,42	Ω

figure 7. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



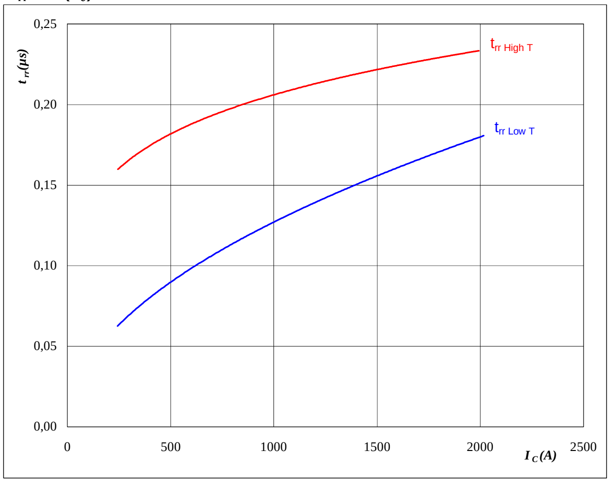
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	-10/+15	V
R_{gon} =	0,42	Ω
R_{goff} =	0,42	Ω

figure 8. **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} =	-10/+15	V
R_{gon} =	0,42	Ω

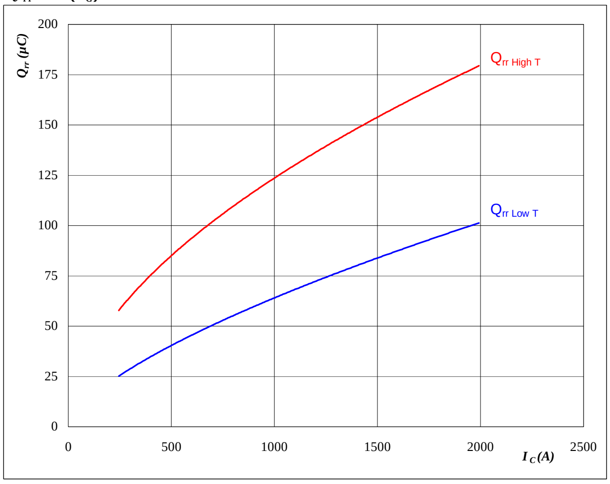
Buck

Buck IGBT and Buck FWD

figure 9.	FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



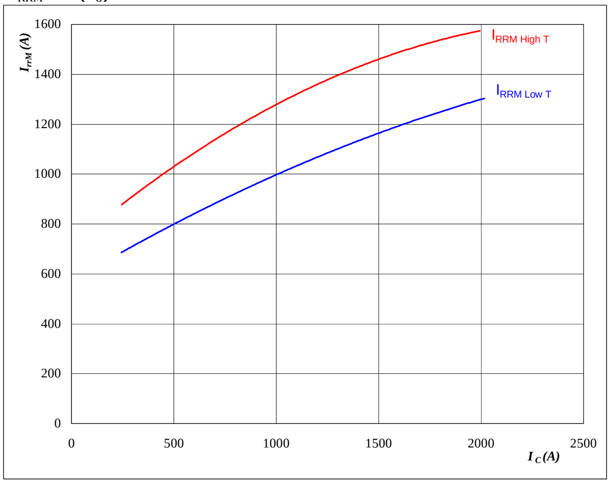
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	-10/+15	V
R_{gon} =	0,42	Ω

figure 10.	FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



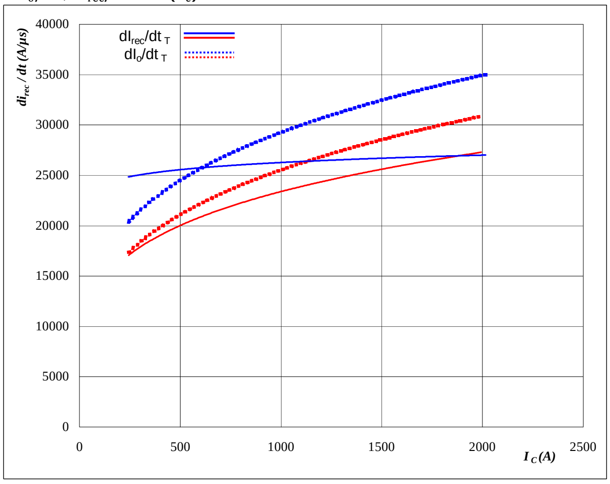
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	-10/+15	V
R_{gon} =	0,42	Ω

figure 11.	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} =	-10/+15	V
R_{gon} =	0,42	Ω

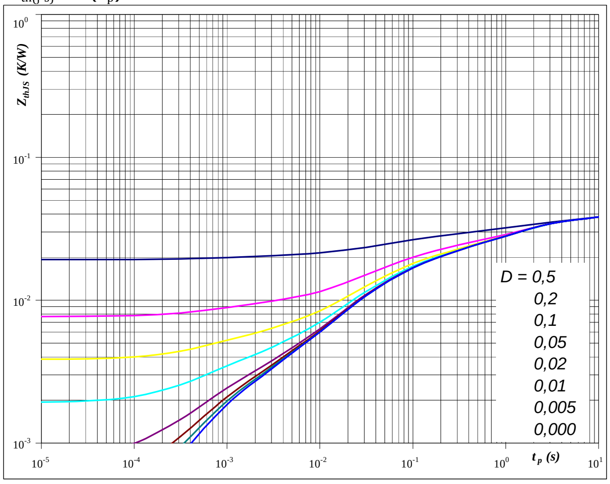
Buck

Buck IGBT and Buck FWD

figure 12. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



At

$D = t_p / T$

IGBT thermal model values with phase-change material

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

IGBT thermal model values

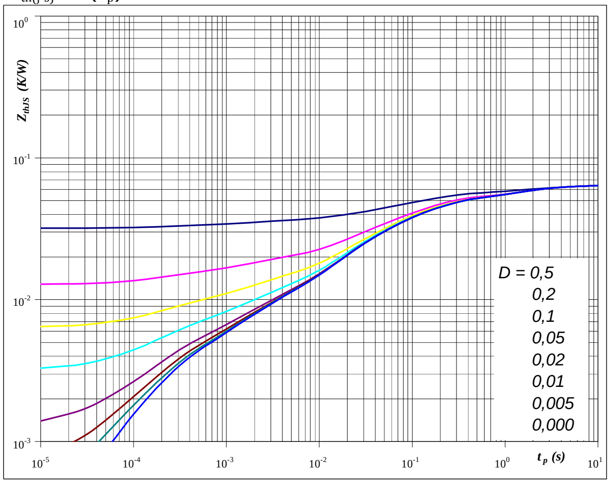
With phase change material

R (K/W)	Tau (s)
1,56E-02	2,31E+00
6,86E-03	3,15E-01
8,33E-03	6,36E-02
5,40E-03	1,92E-02
1,08E-03	2,08E-03
1,24E-03	5,82E-04

figure 13. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At

$D = t_p / T$

FWD thermal model values with phase-change material

$R_{th(j-s)}$ = 0,064 K/W

FWD thermal model values

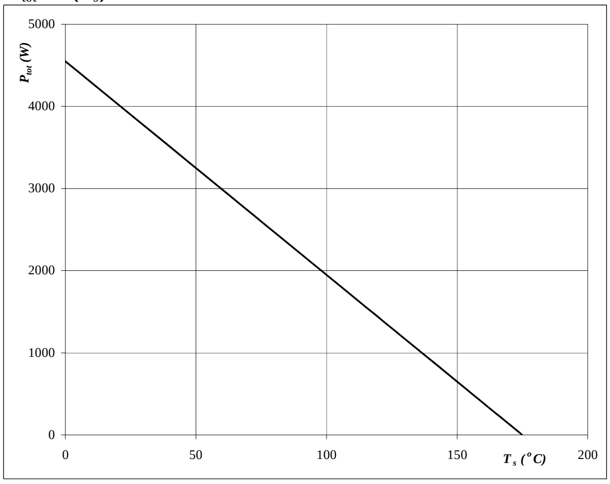
With phase change material

R (K/W)	Tau (s)
1,54E-02	1,70E+00
2,39E-02	1,27E-01
1,70E-02	2,50E-02
4,58E-03	1,61E-03
2,91E-03	1,90E-04

figure 14. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



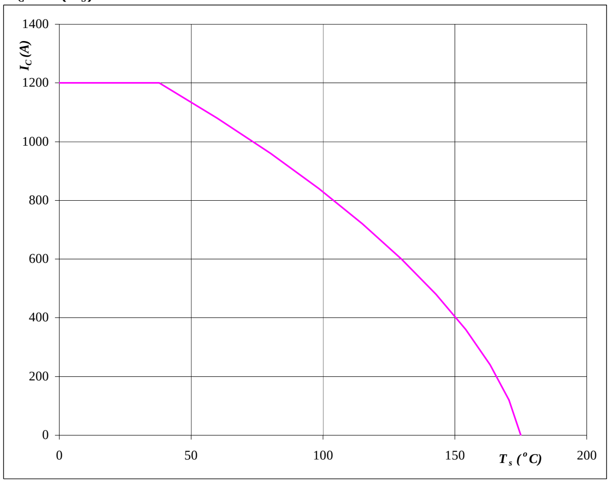
At

T_j = 175 °C

figure 15. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

T_j = 175 °C

V_{GE} = 15 V

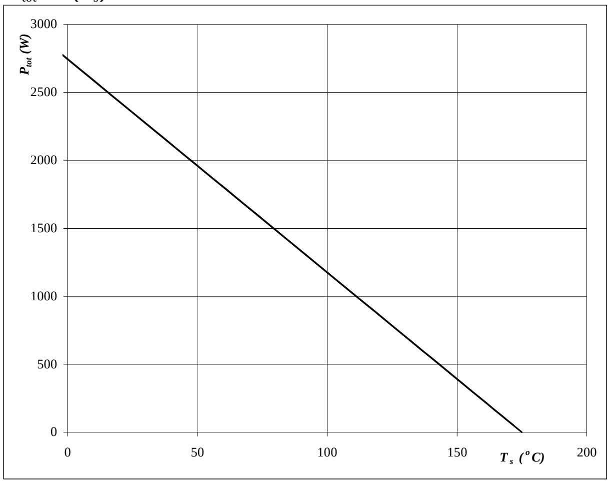
Buck

Buck IGBT and Buck FWD

figure 16. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$

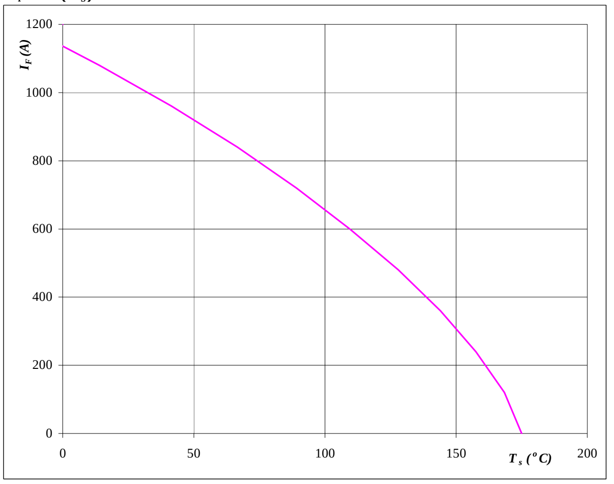


At
T_j = 175 °C

figure 17. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$

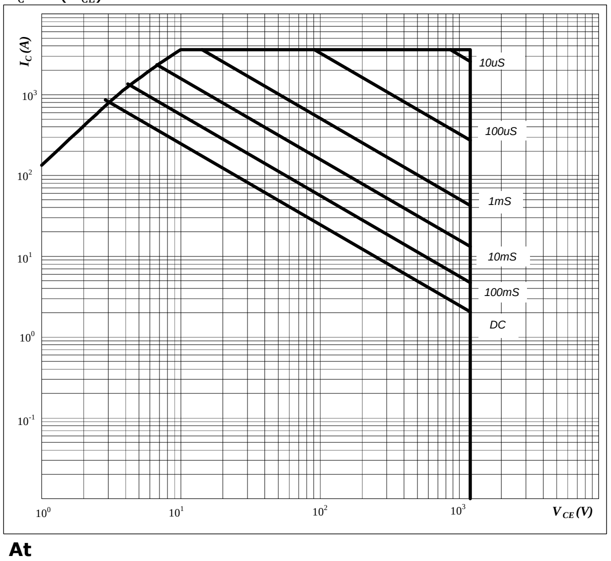


At
T_j = 175 °C

figure 18. **IGBT**

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



At

D =	single pulse	V_{GE} =	15	V
T_s =	80 °C	T_j =	T_{jmax}	

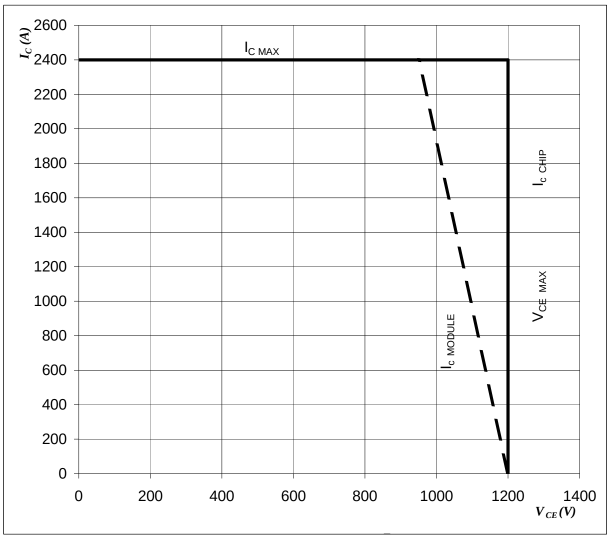
Buck

Buck IGBT and Buck FWD

figure 20.	**IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

$U_{ccminus} = U_{ccplus}$

Switching mode : 3 level switching

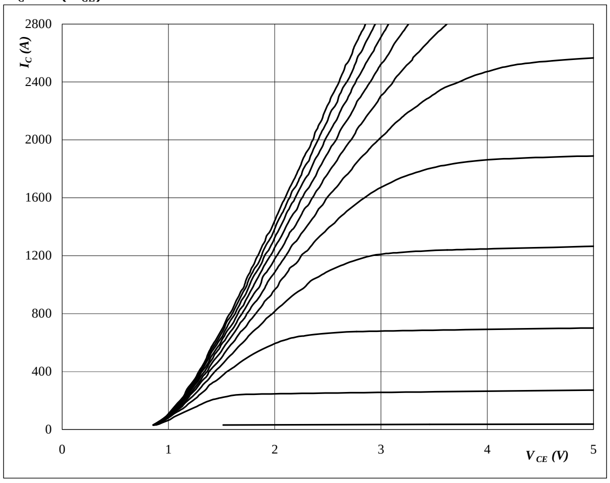
Boost

Boost IGBT and Boost FWD

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 350 µs

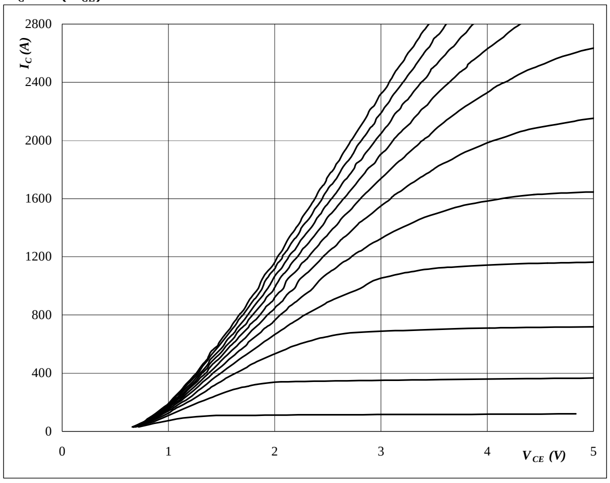
T_j = 25 °C

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

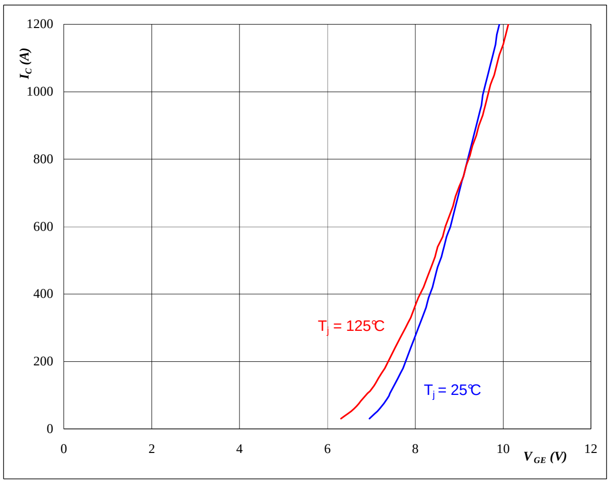
T_j = 125 °C

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

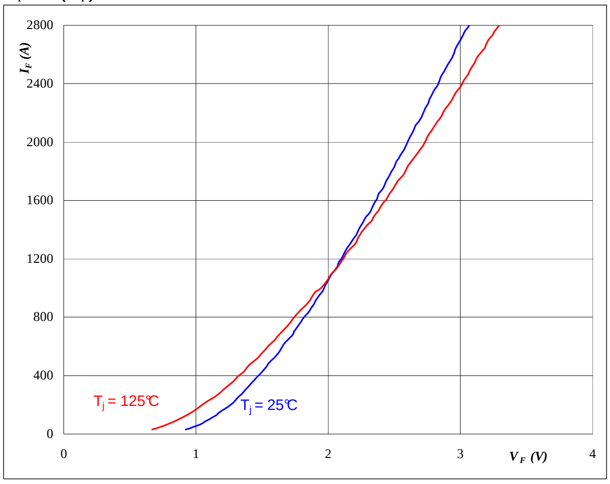
t_p = 350 µs

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

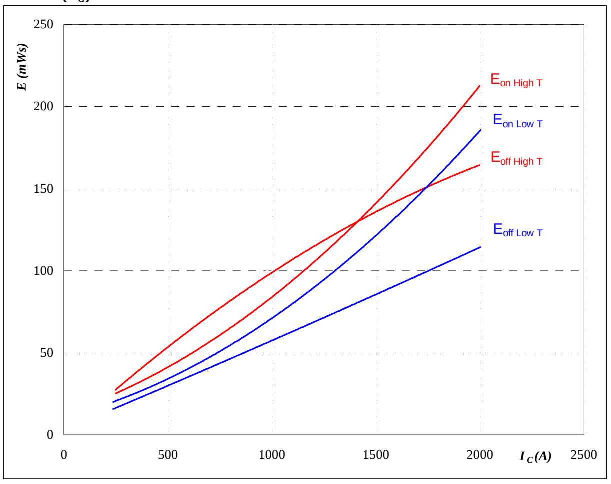
Boost

Boost IGBT and Boost FWD

figure 5.	IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



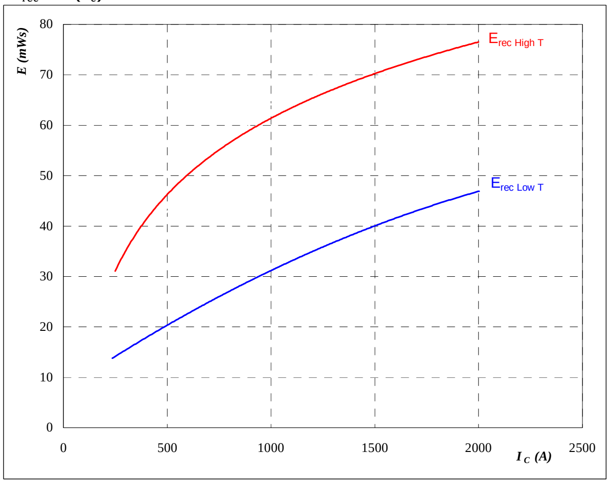
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	-10/ +15	V
R_{gon} =	0,42	Ω
R_{goff} =	0,42	Ω

figure 6.	FWD

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_c)$



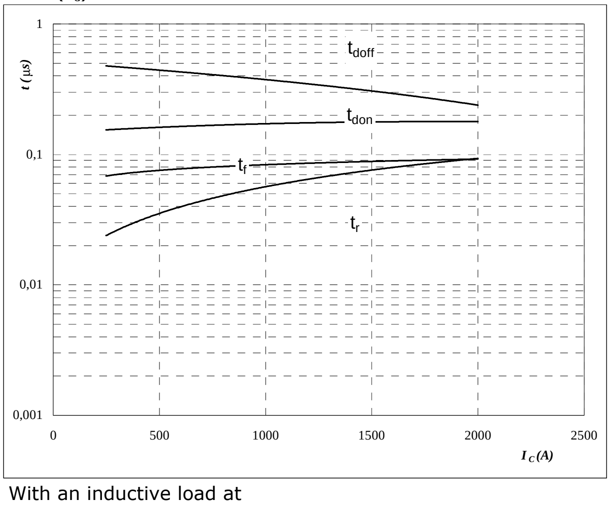
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	-10/ +15	V
R_{gon} =	0,42	Ω

figure 7.	IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



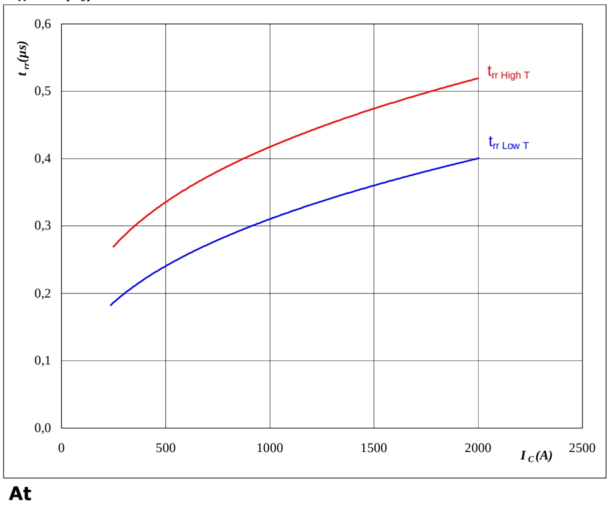
With an inductive load at

T_j =	125	°C	R_{gon} =	0,42	Ω
V_{CE} =	600	V	R_{goff} =	0,42	Ω
V_{GE} =	-10/ +15	V			

figure 8.	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} =	-10/ +15	V
R_{gon} =	0,42	Ω

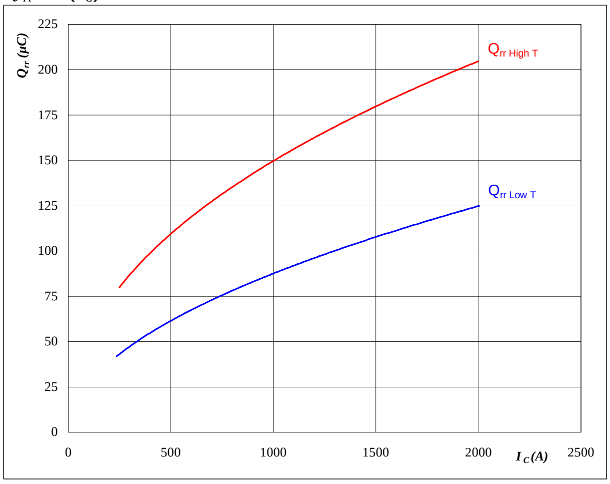
Boost

Boost IGBT and Boost FWD

figure 9. **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



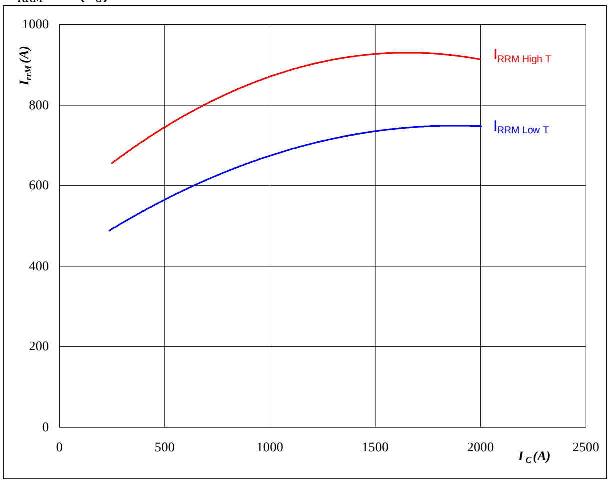
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	-10/ +15	V
R_{gon} =	0,42	Ω

figure 10. **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



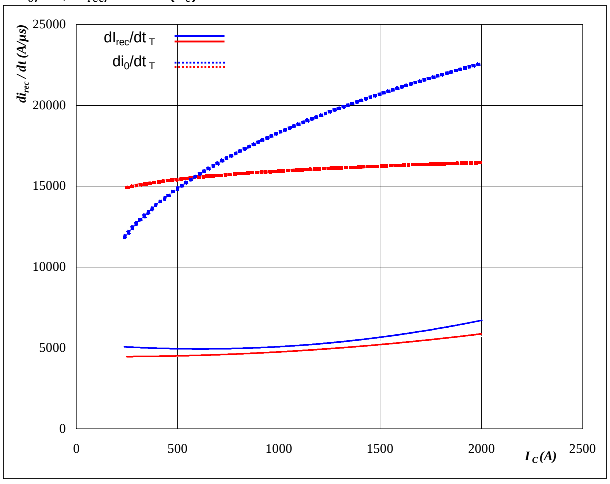
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	-10/ +15	V
R_{gon} =	0,42	Ω

figure 11. **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} =	-10/ +15	V
R_{gon} =	0,4	Ω

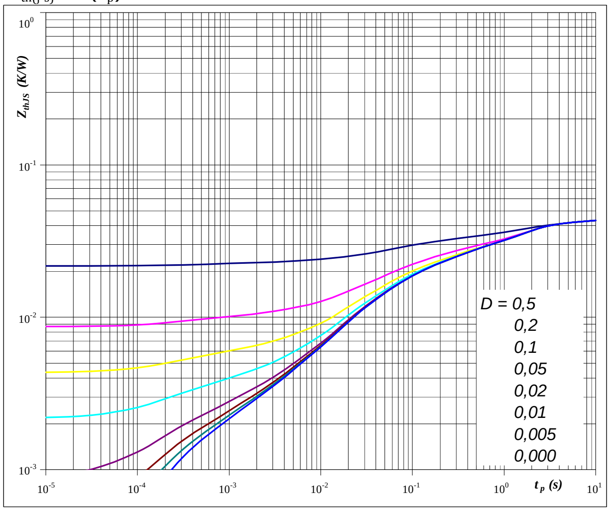
Boost

Boost IGBT and Boost FWD

figure 12. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



At

$D = t_p / T$

IGBT thermal model values with phase-change material

$R_{th(j-s)} =$ 0,043 K/W

IGBT thermal model values

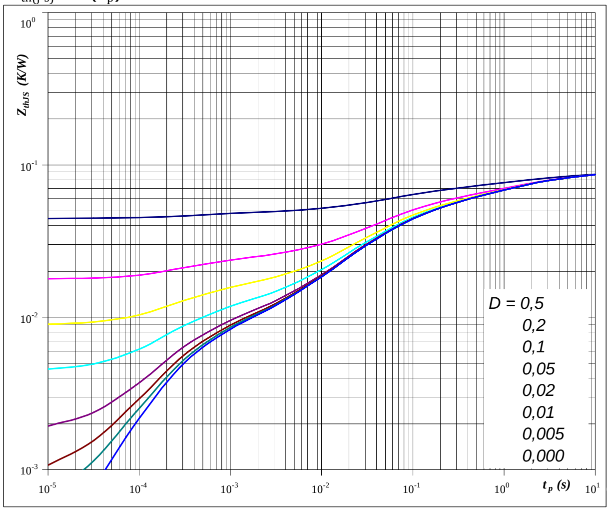
With phase-change material

R (K/W)	Tau (s)
1,98E-02	1,78E+00
1,01E-02	1,66E-01
1,07E-02	3,06E-02
1,43E-03	2,59E-03
1,32E-03	2,69E-04

figure 13. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At

$D = t_p / T$

FWD thermal model values with phase-change material

$R_{th(j-s)} =$ 0,089 K/W

FWD thermal model values

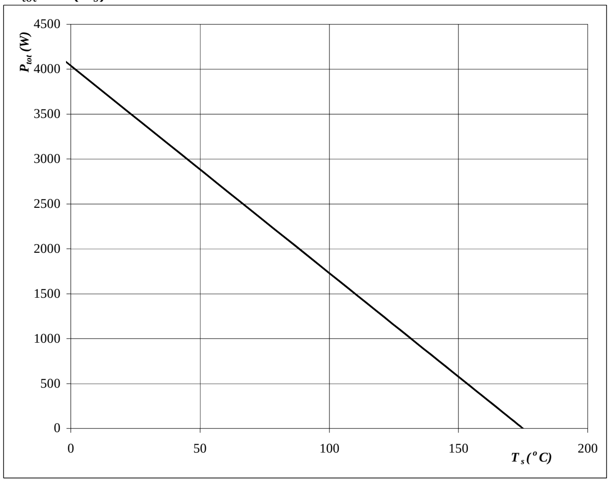
With phase-change material

R (K/W)	Tau (s)
1,39E-02	5,78E+00
1,77E-02	1,38E+00
1,62E-02	2,57E-01
2,22E-02	5,31E-02
9,23E-03	1,60E-02
3,35E-03	2,27E-03
6,26E-03	2,74E-04

figure 14. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



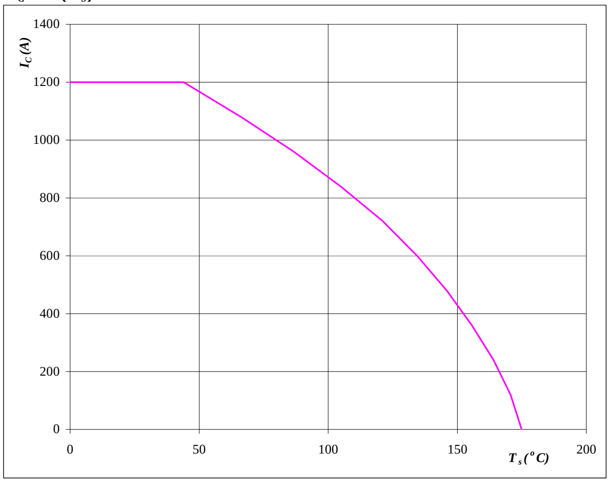
At

$T_j =$ 175 ºC

figure 15. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

$T_j =$ 175 ºC

$V_{GE} =$ 15 V

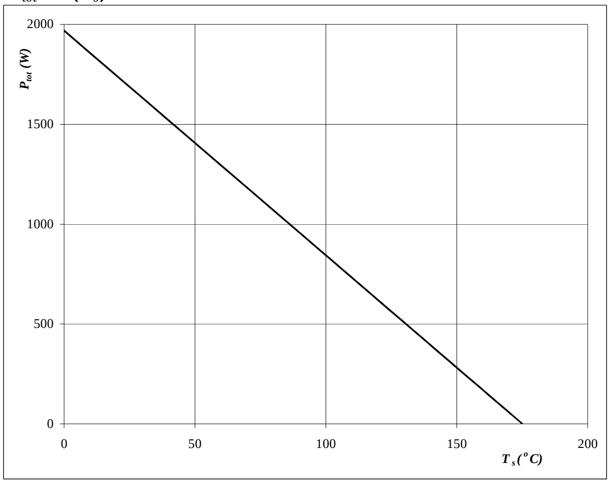
Boost

Boost IGBT and Boost FWD

figure 16.	FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



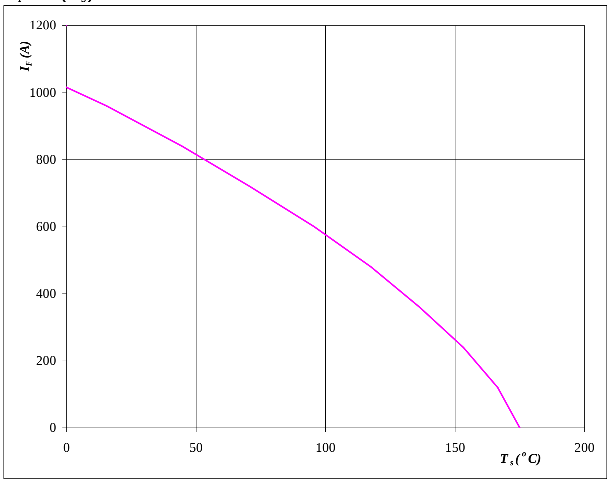
At

T_j = 175 ºC

figure 17.	FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



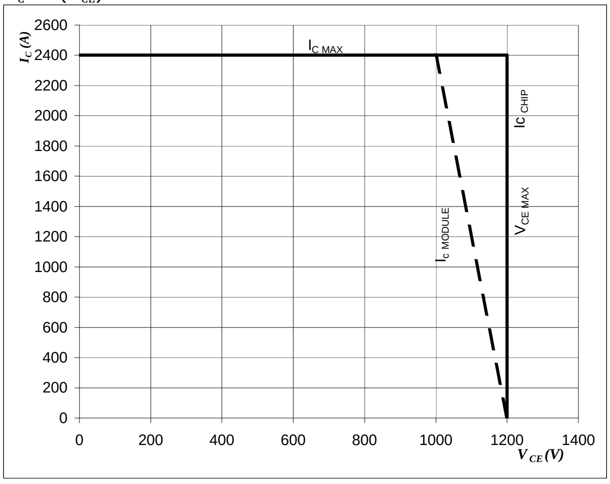
At

T_j = 175 ºC

figure 18.	IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

$U_{ccminus}=U_{ccplus}$

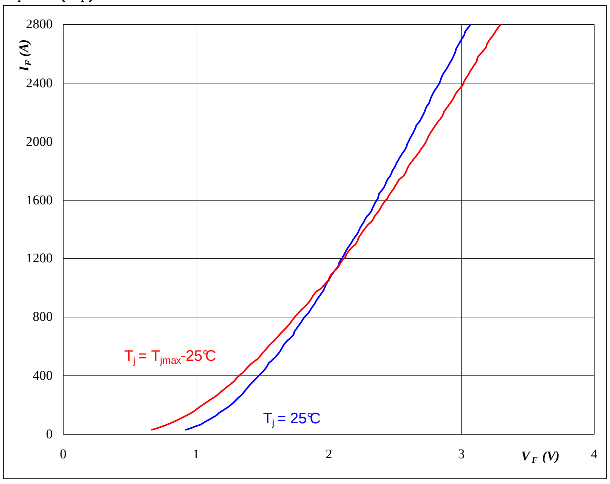
Switching mode : 3 level switching

Boost Inverse Diode

figure 19. **Boost Inverse Diode**

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



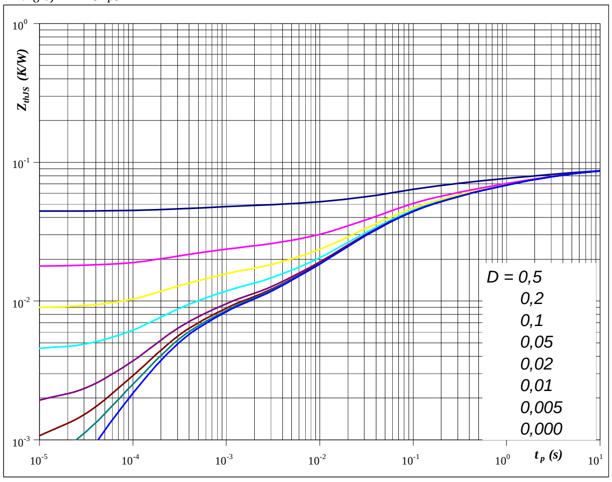
At

t_p = 250 µs

figure 20. **Boost Inverse Diode**

FWD transient thermal impedance as a function of pulse width

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



At

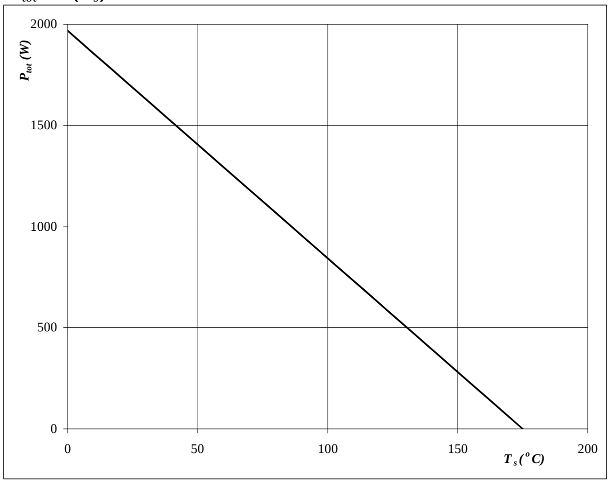
$D = t_p / T$

$R_{th(j-s)}$ = 0,09 K/W

figure 21. **Boost Inverse Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



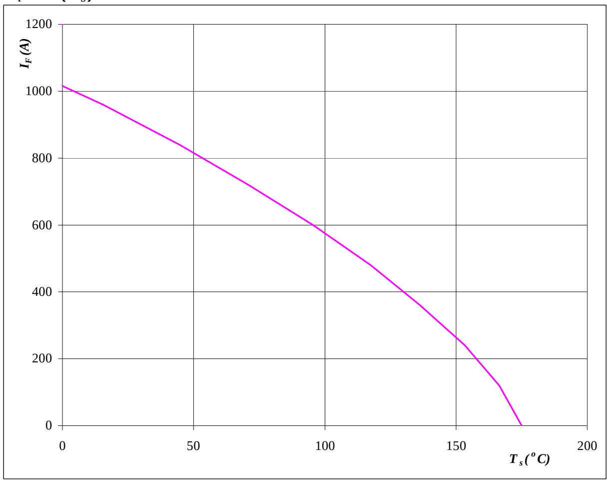
At

T_j = 175 ºC

figure 22. **Boost Inverse Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



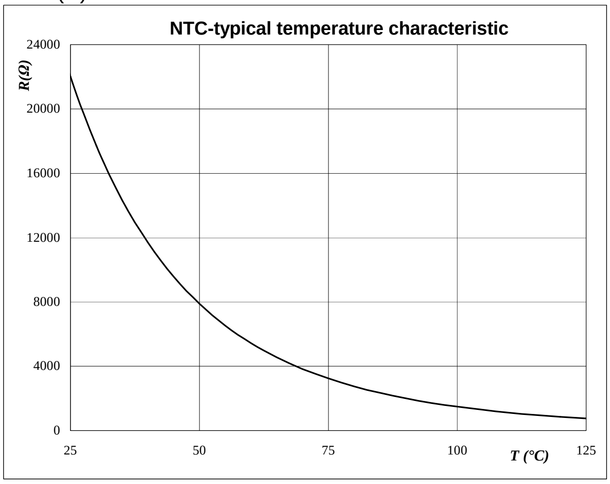
At

T_j = 175 ºC

Thermistor

figure 1.	Thermistor

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



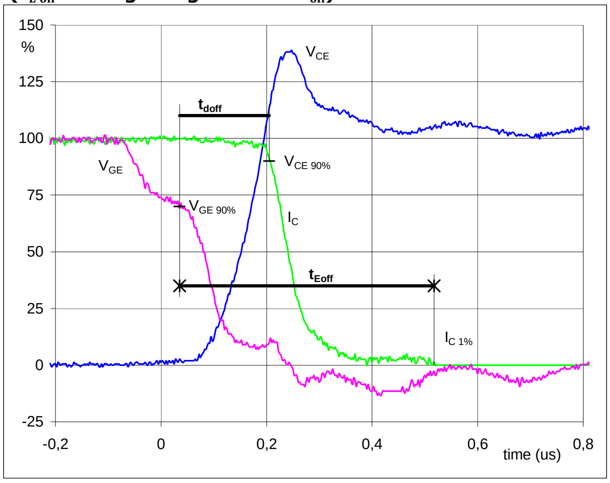
Switching Definitions Buck

General conditions

T_j	=	125 °C
R_{gon}	=	0,42 Ω
R_{goff}	=	0,42 Ω

figure 1. **IGBT**

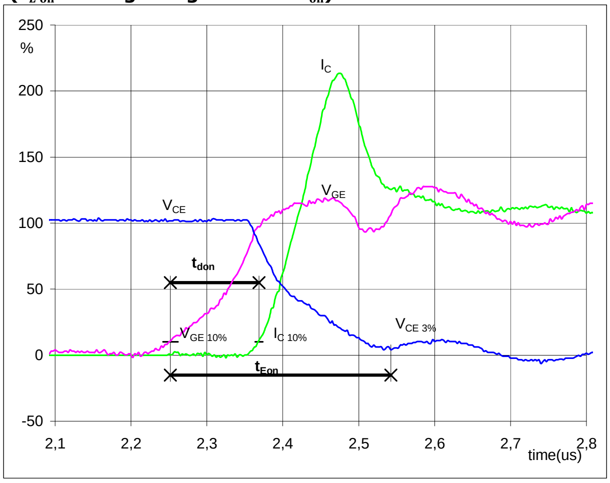
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-10	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	1201	A
t_{doff} =	0,23	μs
$t_{E\,off}$ =	0,48	μs

figure 2. **IGBT**

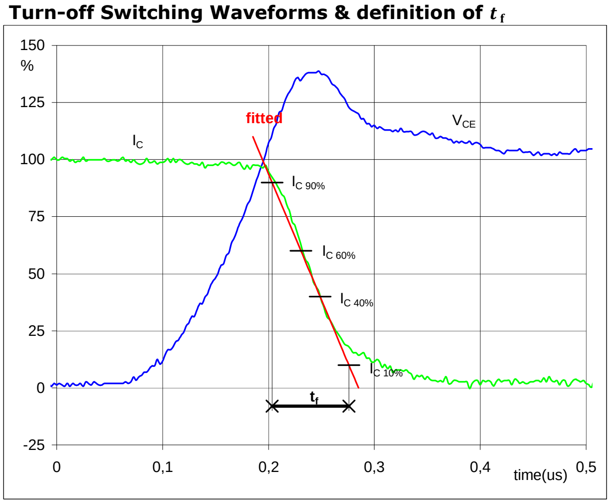
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-10	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	1201	A
t_{don} =	0,11	μs
$t_{E\,on}$ =	0,29	μs

figure 3. **IGBT**

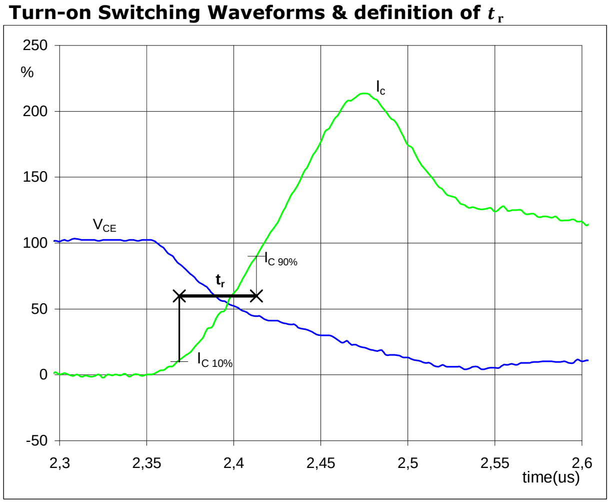
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	1201	A
t_f =	0,07	μs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

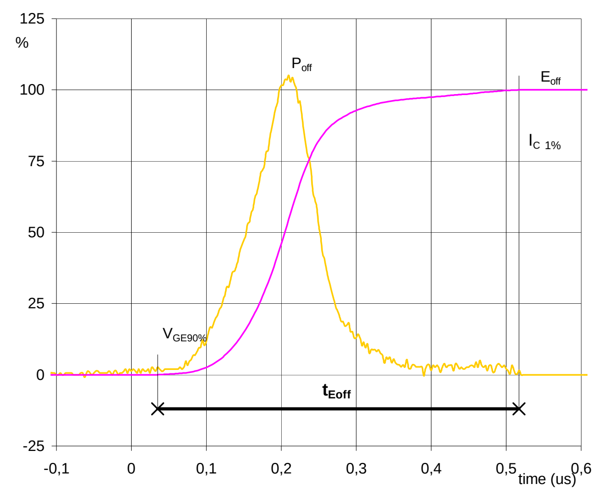


V_C (100%) =	600	V
I_C (100%) =	1201	A
t_r =	0,04	μs

Switching Definitions Buck

figure 5. **IGBT**

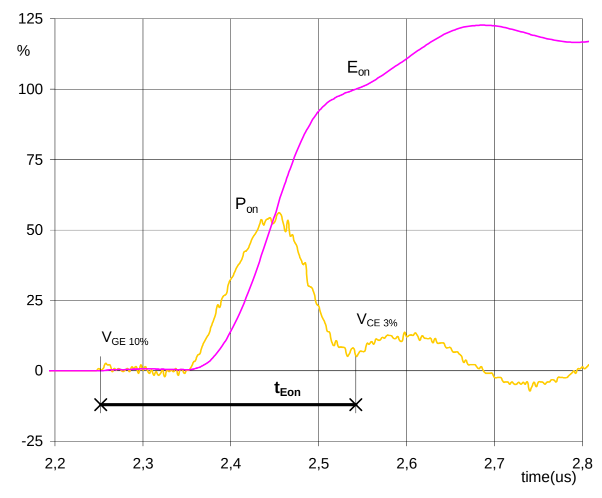
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	720,80	kW
E_{off} (100%) =	86,78	mJ
$t_{E\,off}$ =	0,48	μs

figure 6. **IGBT**

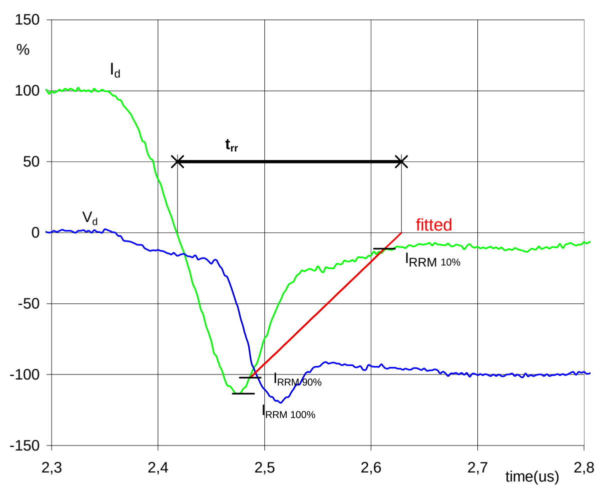
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	720,80	kW
E_{on} (100%) =	48,91	mJ
$t_{E\,on}$ =	0,29	μs

figure 7. **FWD**

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

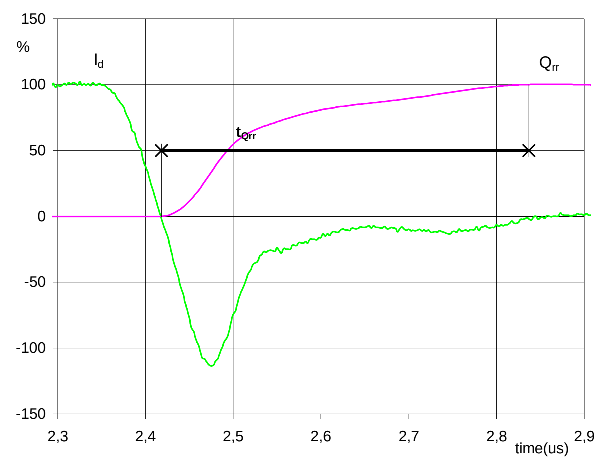


V_d (100%) =	600	V
I_d (100%) =	1201	A
I_{RRM} (100%) =	-1355	A
t_{rr} =	0,21	μs

Switching Definitions Buck

figure 8.	FWD

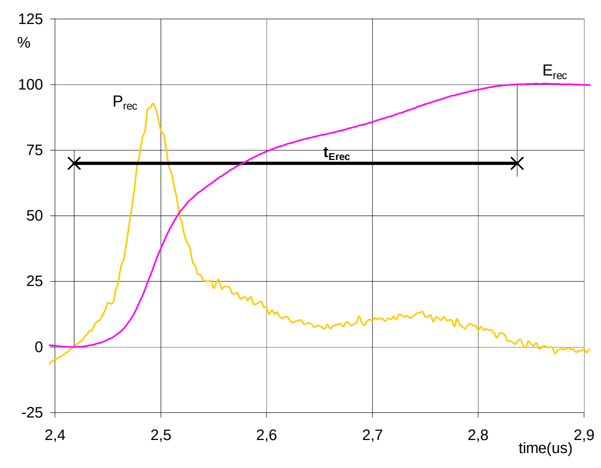
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	1201	A
Q_{rr} (100%) =	136,71	µC
$t_{Q\,rr}$ =	0,42	µs

figure 9.	FWD

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



P_{rec} (100%) =	720,80	kW
E_{rec} (100%) =	61,41	mJ
$t_{E\,rec}$ =	0,42	µs

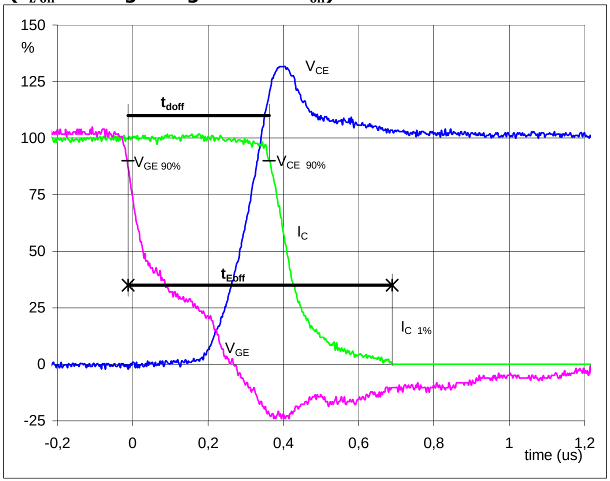
Switching Definitions Boost

General conditions

T_j	=	125 °C
R_{gon}	=	0,42 Ω
R_{goff}	=	0,42 Ω

figure 1. **IGBT**

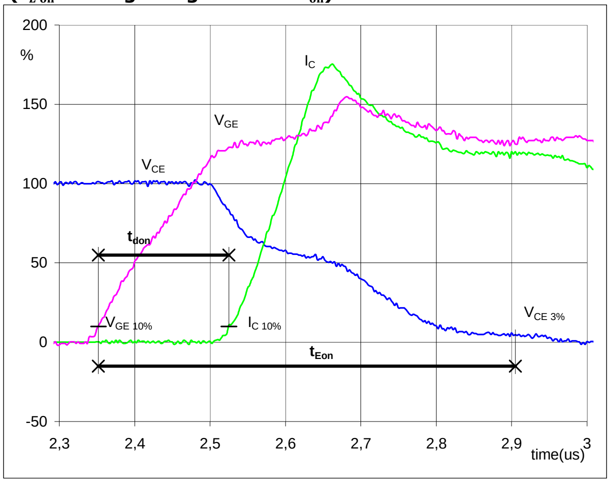
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-10	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	1200	A
t_{doff} =	0,34	μs
t_{Eoff} =	0,70	μs

figure 2. **IGBT**

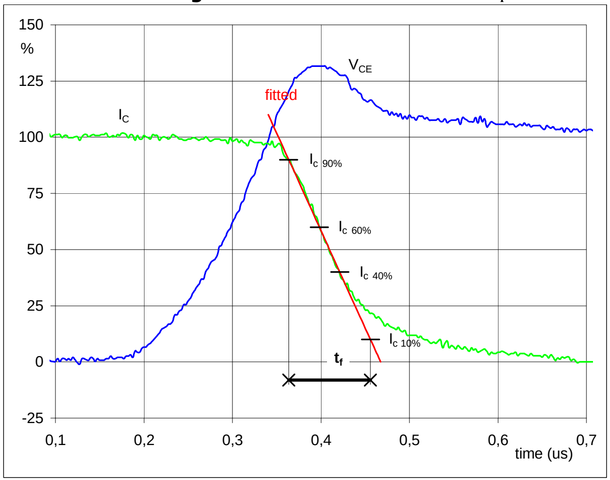
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-10	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	1200	A
t_{don} =	0,17	μs
t_{Eon} =	0,55	μs

figure 3. **IGBT**

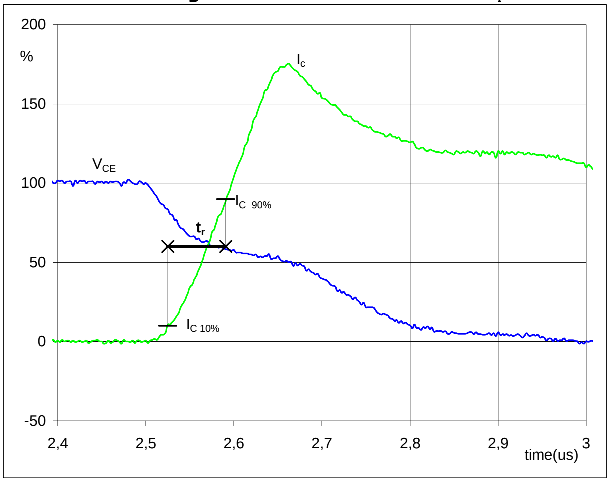
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	1200	A
t_f =	0,092	μs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

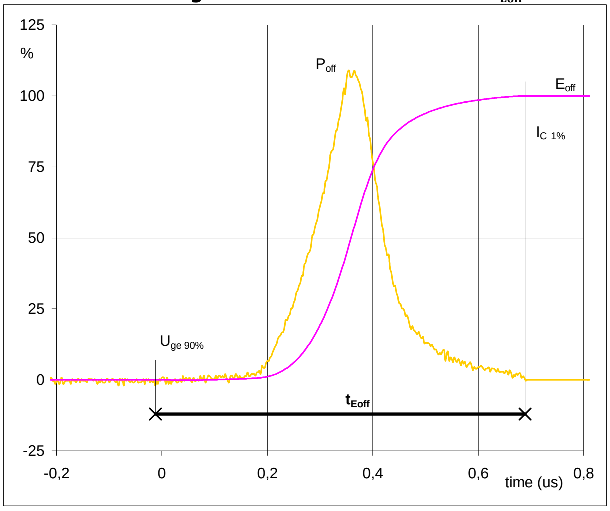


V_C (100%) =	600	V
I_C (100%) =	1200	A
t_r =	0,065	μs

Switching Definitions Boost

figure 5. **IGBT**

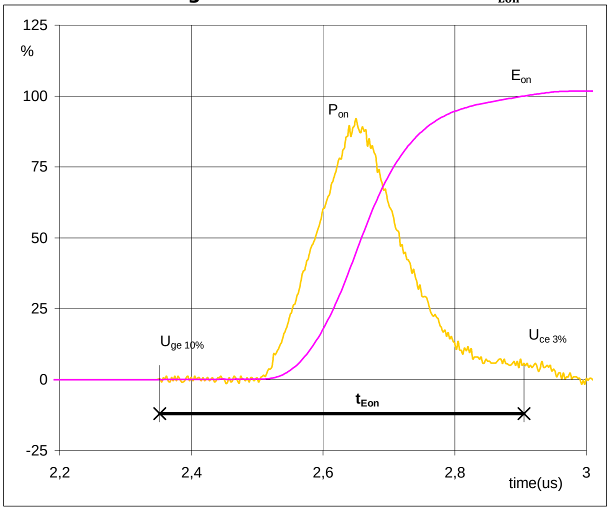
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	719,72	kW
E_{off} (100%) =	119,96	mJ
$t_{E\,off}$ =	0,70	µs

figure 6. **IGBT**

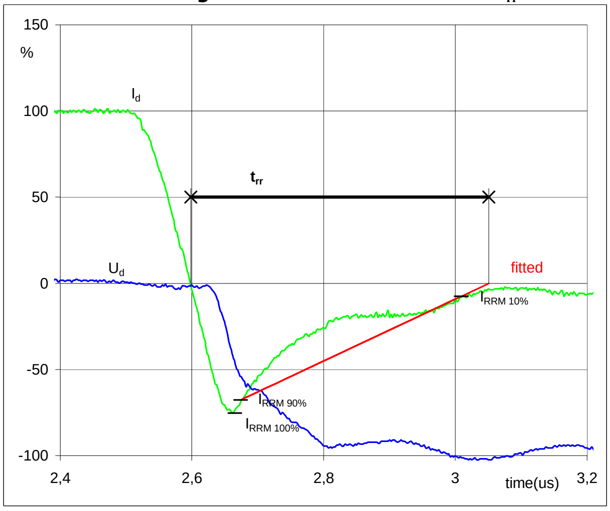
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	719,724	kW
E_{on} (100%) =	104,74	mJ
$t_{E\,on}$ =	0,55	µs

figure 7. **FWD**

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

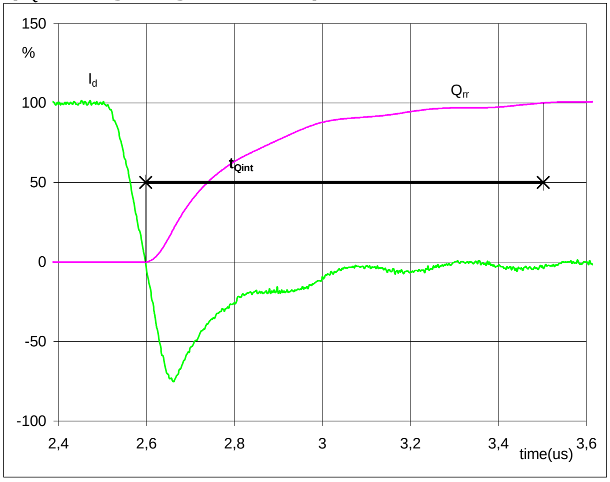


V_d (100%) =	600	V
I_d (100%) =	1200	A
I_{RRM} (100%) =	-903	A
t_{rr} =	0,45	µs

Switching Definitions Boost

figure 8. **FWD**

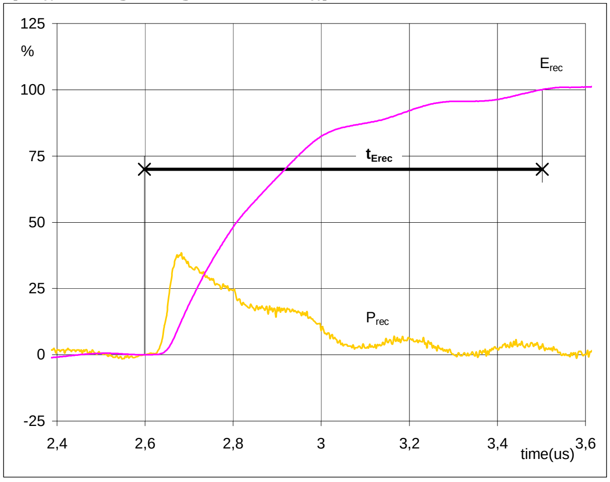
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



I_d (100%) =	1200	A
Q_{rr} (100%) =	172,55	μC
t_{Qint} =	0,90	μs

figure 9. **FWD**

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

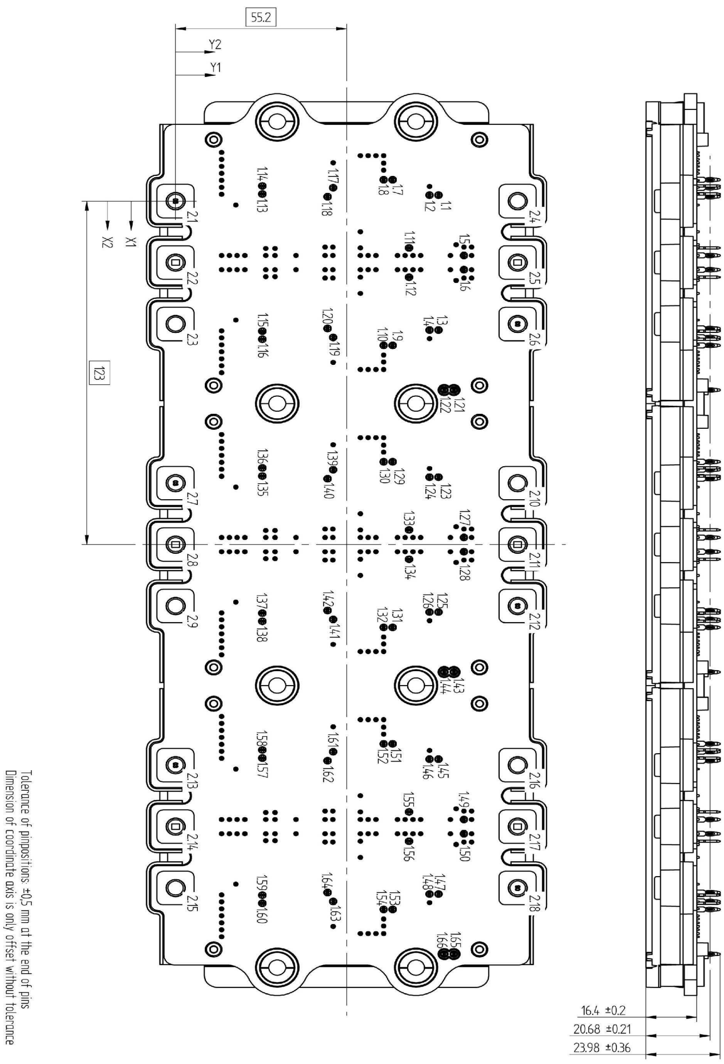


P_{rec} (100%) =	719,72	kW
E_{rec} (100%) =	69,81	mJ
$t_{E rec}$ =	0,90	μs

Outline

Driver pins			
Pin	X1	Y1	Function
1.1	-2,15	84,85	G11-1
1.2	-2,15	81,95	E11-1
1.3	46,15	84,85	G13-2
1.4	46,15	81,95	E13-2
1.5	19,45	93,05	DC+desat
1.6	24,55	93,05	DC+desat
1.7	-7,65	70,05	G13-1
1.8	-7,65	67,15	E13-1
1.9	51,65	70,05	G13-2
1.10	51,65	67,15	E13-2
1.11	16,75	75,35	GND_desat
1.12	27,25	75,35	GND_desat
1.13	-2,55	28	G14-1
1.14	-5,45	28	E14-1
1.15	46,55	28	G14-2
1.16	49,45	28	E14-2
1.17	-4,8	50,85	G12-1
1.18	-1,6	49,05	E12-1
1.19	48,8	50,85	G12-2
1.20	45,6	49,05	E12-2
1.21	67,65	89,8	Therm1-1
1.22	67,65	86,7	Therm2-1
1.23	98,85	84,85	G11-3
1.24	98,85	81,95	E11-3
1.25	147,15	84,85	G13-4
1.26	147,15	81,95	E13-4
1.27	120,45	93,05	DC+desat
1.28	125,55	93,05	DC+desat
1.29	93,35	70,05	G13-3
1.30	93,35	67,15	E13-3
1.31	152,65	70,05	G13-4
1.32	152,65	67,15	E13-4
1.33	117,75	75,35	GND_desat
1.34	128,25	75,35	GND_desat
1.35	98,45	28	G14-3
1.36	95,55	28	E14-3
1.37	147,55	28	G14-4
1.38	150,45	28	E14-4
1.39	96,2	50,85	G12-3
1.40	99,4	49,05	E12-3
1.41	149,8	50,85	G12-4
1.42	146,6	49,05	E12-4
1.43	168,65	89,8	Therm1-2
1.44	168,65	86,7	Therm2-2
1.45	199,85	84,85	G11-5
1.46	199,85	81,95	E11-5
1.47	248,15	84,85	G13-6
1.48	248,15	81,95	E13-6
1.49	221,45	93,05	DC+desat
1.50	226,55	93,05	DC+desat
1.51	194,35	70,05	G13-5
1.52	194,35	67,15	E13-5
1.53	253,65	70,05	G13-6
1.54	253,65	67,15	E13-6
1.55	218,75	75,35	GND_desat
1.56	229,25	75,35	GND_desat
1.57	199,45	28	G14-5
1.58	196,55	28	E14-5
1.59	248,55	28	G14-6
1.60	251,45	28	E14-6
1.61	197,2	50,85	G12-5
1.62	200,4	49,05	E12-5
1.63	250,8	50,85	G12-6

Low current connections			
M6 screw	X2	Y2	Function
2.1	0	0	PH
2.2	22	0	PH
2.3	44	0	PH
2.4	0	110,4	DC+
2.5	22	110,4	GND
2.6	44	110,4	DC-
2.7	101	0	PH
2.8	123	0	PH
2.9	145	0	PH
2.10	101	110,4	DC+
2.11	123	110,4	GND
2.12	145	110,4	DC-
2.13	202	0	PH
2.14	224	0	PH
2.15	246	0	PH
2.16	202	110,4	DC+
2.17	224	110,4	GND
2.18	246	110,4	DC-



Driver pins			
Pin	X1	Y1	Function
1.64	247,6	49,05	E12-6
1.65	269,7	89,8	Therm1-3
1.66	269,7	86,7	Therm2-3

Ordering Code and Marking - Outline - Pinout

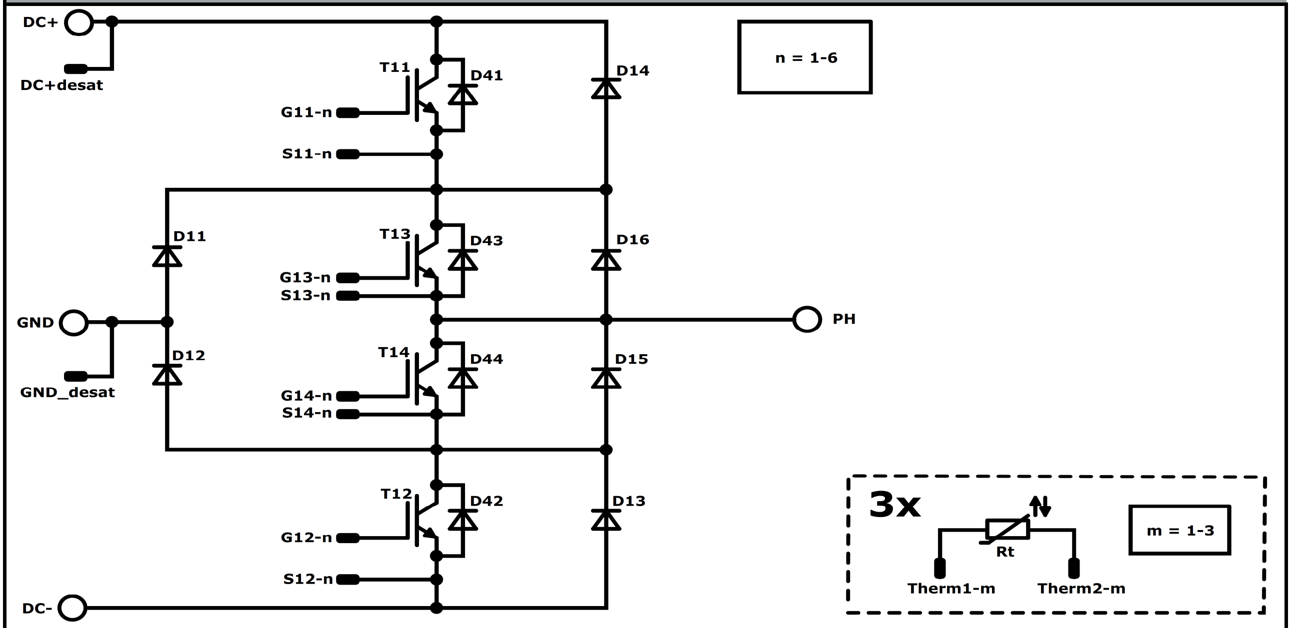
Ordering Code & Marking

Version	in DataMatrix as
Standard	70-W624N3A1K2SC-L400FP
Standard with thermal paste	70-W624N3A1K2SC-L400FP-/3/

Name / Date code / Lot / Serial / Vincotech / UL

Text	Name	Date code	UL & Vinco	Lot	Serial
	NN-NNNNNNNNNNNNNN-NNNNNNNN	WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code	
	TTTT-TTT	LLLLL	SSSS	WWYY	

Pinout



NOTE: Driver pins for parallel devices are not connected inside the module!

Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	1200 A	Buck Switch	
D11, D12	FWD	1200 V	1200 A	Buck Diode	
T13, T14	IGBT	1200 V	1200 A	Boost Switch	
D13, D14	FWD	1200 V	900 A	Boost Diode	
D15, D16	FWD	1200 V	900 A	Boost Inverse Diode	
D41, D42	FWD	1200 V	90 A	Buck sw. Prot. Diode	
D43, D44	FWD	1200 V	90 A	Boost sw. Prot. Diode	
Rt	NTC			Thermistor	

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

Handling instruction
Handling instructions for VINco X12 packages see vincotech.com website.

Package data
Package data for VINco X12 packages see vincotech.com website.

Document No.:	Date:	Modification:	Pages
70-W624N3A1K2SC-L400FP-D3-14	10 Jul. 2019	Marketing application voltage modified	1

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As used herein:

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.

单击下面可查看定价，库存，交付和生命周期等信息

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