VINcoNPC X12	1500 V / 1200 A

Features

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

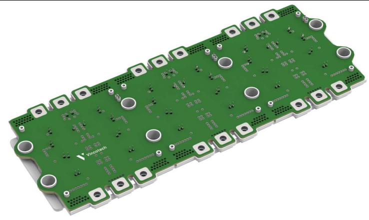
Target Applications

- Solar inverter
- Motor Drive

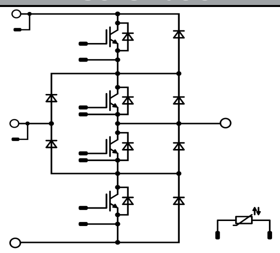
Types

- 70-W624N3A1K2SC01-L400FP10

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	984	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	2228	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
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, $T_j \le T_{op}$ 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

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
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	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
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_{is}	t = 2 s	DC Test Voltage*	4000	V
		t = 1 min	AC Test Voltage	2500	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm
Competative Tracking Index	CTI			>200	

* 100 % tested in productiuon

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	1,58	1,91	2,07	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}							0,1667		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff}=0,42 Ω R_{gon}=0,42 Ω	+16/-8	600	1200	25 150		118 128		ns
Rise time	t_r					25 150		44 46		ns
Turn-off delay time	$t_{d(off)}$					25 150		205 259		ns
Fall time	t_f					25 150		56 87		ns
Turn-on energy loss per pulse	E_{on}					25 150		38,62 46,38		mWs
Turn-off energy loss per pulse	E_{off}					25 150		73,75 117,34		mWs
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		67,2		nF
Reverse transfer capacitance	C_{rss}							2,4		nF
Gate charge	Q_G		±15	960	1200	25		9120		nC
Thermal resistance chip to heatsink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,04		K/W
Buck Diode										
Diode forward voltage	V_F				1200	25 150		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 R_{gon}=0,42 Ω	+16/-8	600	1200	25 150		1069 1399		A
Reverse recovery time	t_{rr}					25 150		100 226		ns
Reverse recovered charge	Q_{rr}					25 150		66,82 141,96		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		24944 26086		A/µs
Reverse recovered energy	E_{rec}					25 150		28,82 67,86		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	25 150		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	+16/-8	600	1200			158 174		ns
Rise time	t_r					25 150		64 66		ns
Turn-off delay time	$t_{d(off)}$					25 150		273 342		ns
Fall time	t_f					25 150		57 92		ns
Turn-on energy loss per pulse	E_{on}					25 150		84,6 104,7		mWs
Turn-off energy loss per pulse	E_{off}					25 150		68,3 120,0		mWs
Input capacitance	C_{ies}	f = 1 MHz	0	25	1200	25		75,6		nF
Output capacitance	C_{oss}							4,86		nF
Reverse transfer capacitance	C_{rss}							3,24		nF
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	25 150	1,35	1,90 1,84	2,05	V
Reverse leakage current	I_R								168	μA
Thermal resistance chip to heatsink	$R_{th(j-s)}$							0,09		K/W
Boost Diode										
Diode forward voltage	V_F				900	25 150	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_{goff}=0,42 Ω R_{gon}=0,42 Ω	+16/-8	600	1200	25 150		696 903		A
Reverse recovery time	t_{rr}					25 150		296 451		ns
Reverse recovered charge	Q_{rr}					25 150		89 173		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		5538 4822		A/μs
Reverse recovery energy	E_{rec}					150 150		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

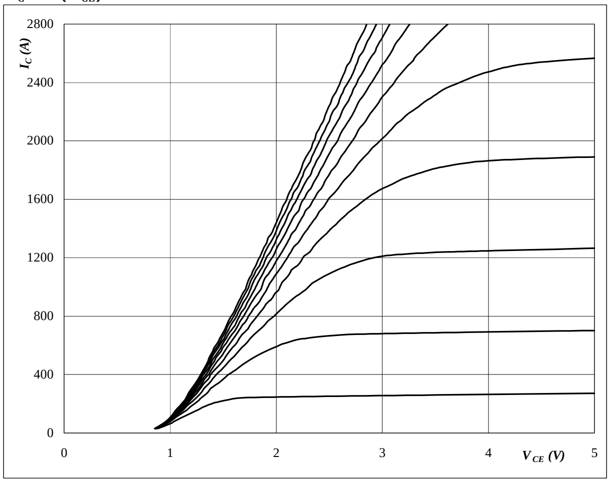
Buck

Buck IGBT and Buck FWD

figure 1	IGBT

Typical output characteristics

$I_C = f(V_{CE})$



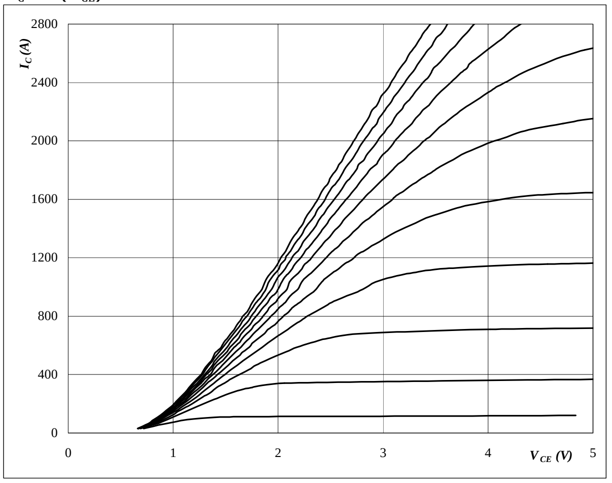
At

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

$I_C = f(V_{CE})$



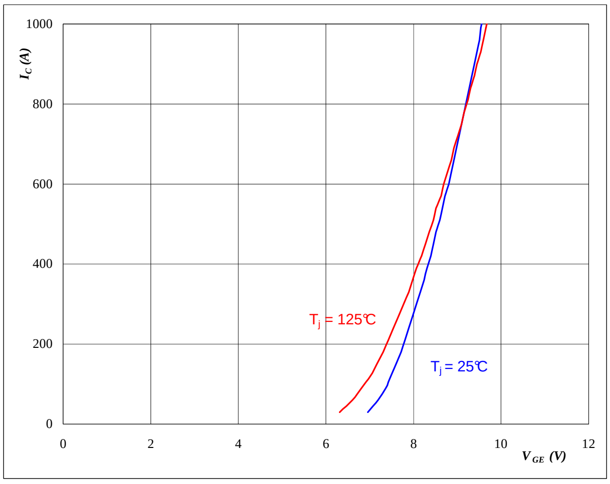
At

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

$I_C = f(V_{GE})$



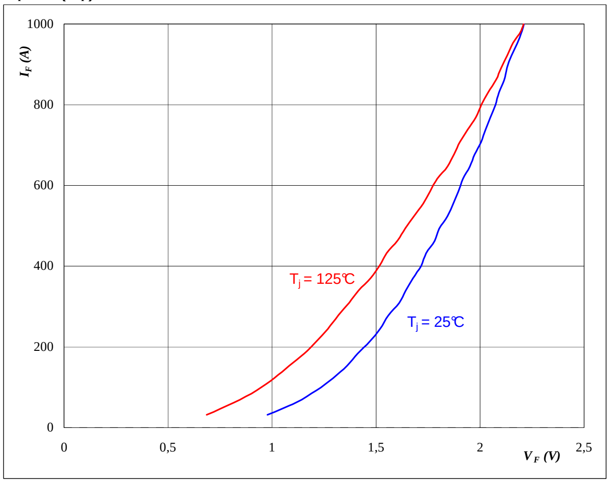
At

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

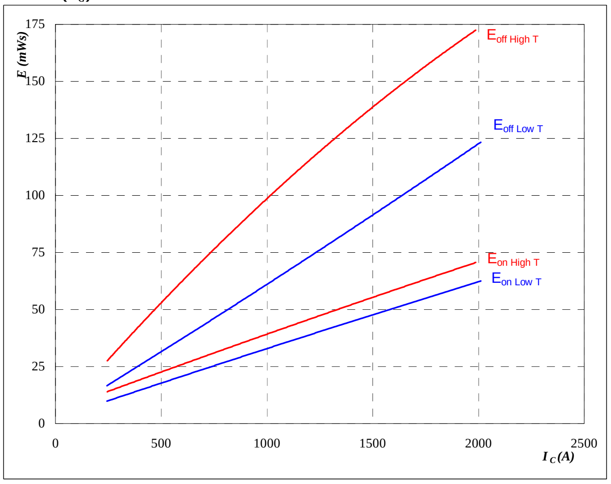
Buck

Buck IGBT and Buck FWD

figure 5 IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



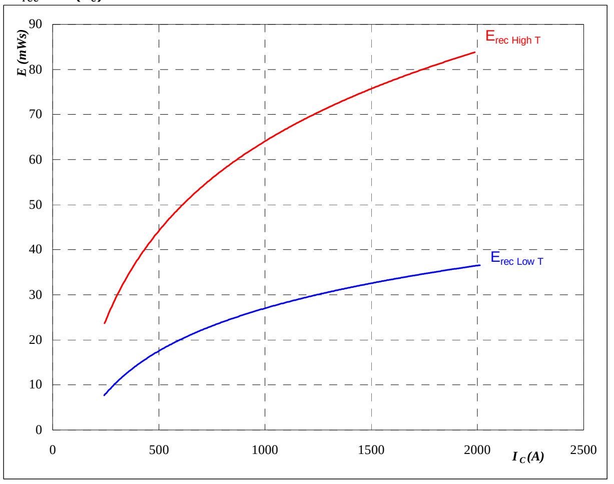
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	+16/-8	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

$E_{rec} = f(I_c)$



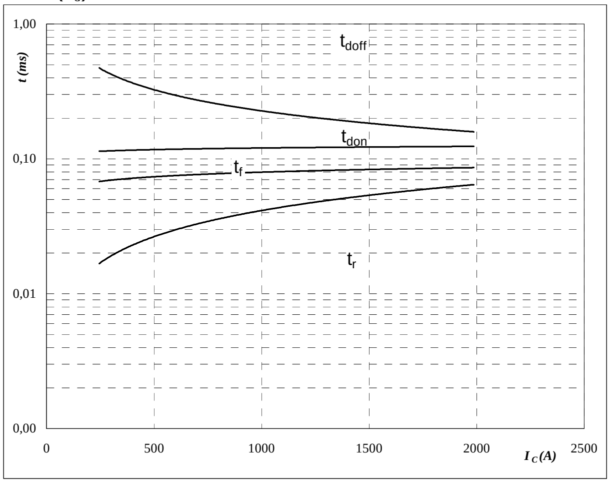
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	+16/-8	V
R_{gon} =	0,42	Ω

figure 7 IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



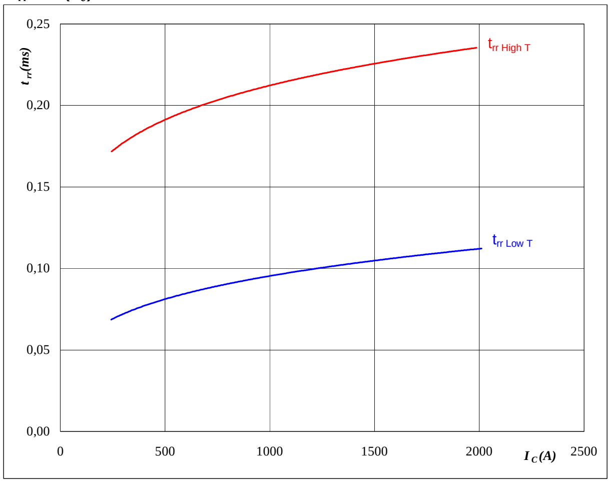
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	+16/-8	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} =	+16/-8	V
R_{gon} =	0,42	Ω

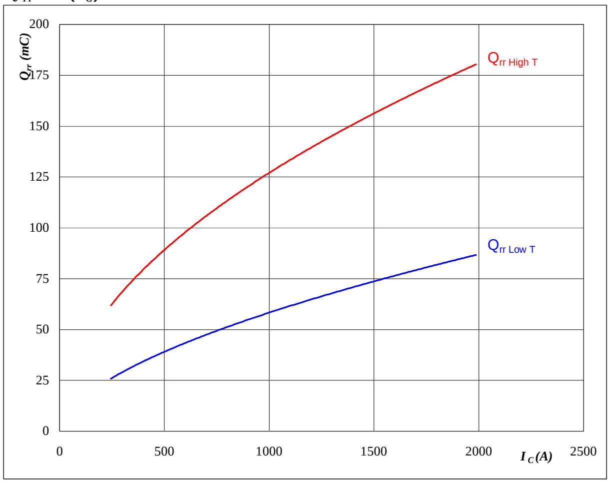
Buck

Buck IGBT and Buck FWD

figure 9 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



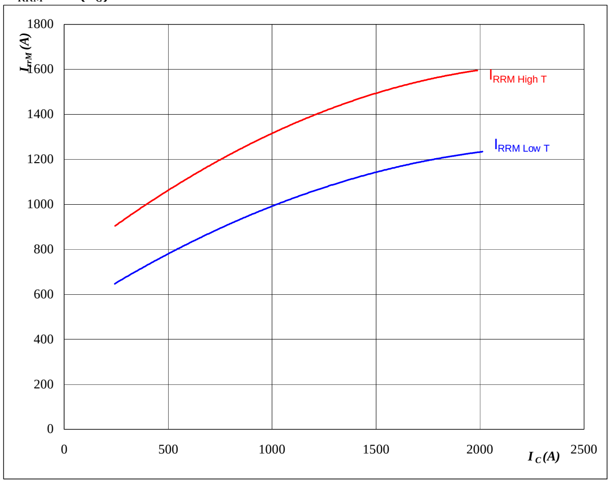
At

T_j =	25/125	°C	T_j =	25/125	°C
V_{CE} =	600	V			
V_{GE} =	+16/-8	V			
R_{gon} =	0,42	Ω			

figure 10 FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



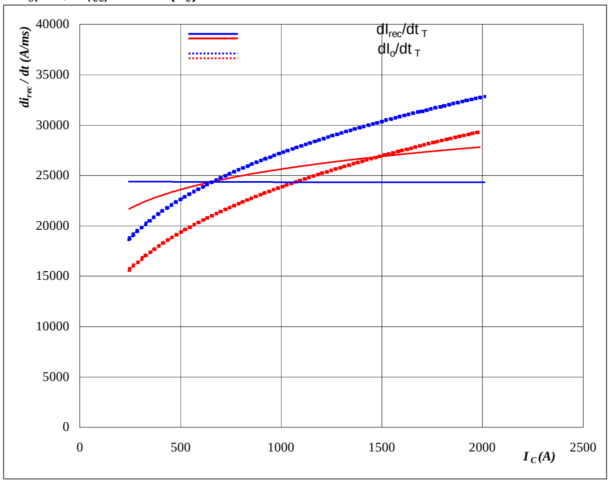
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	+16/-8	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} =	+16/-8	V
R_{gon} =	0,42	Ω

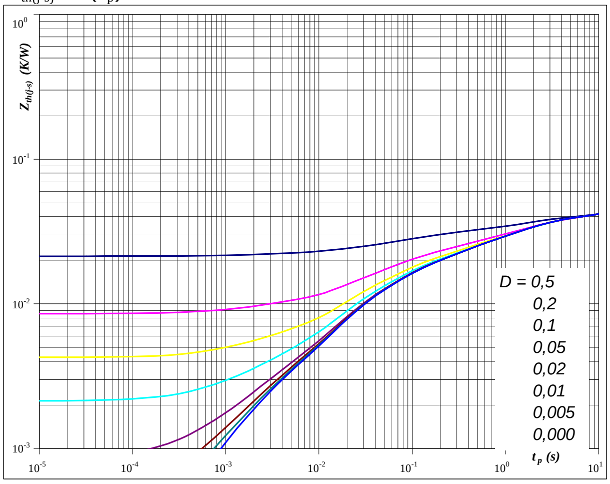
Buck

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

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

IGBT thermal model values

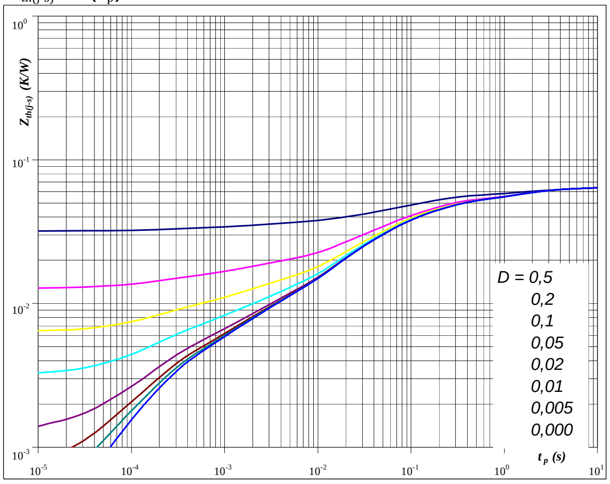
With phase change material

R (K/W)	Tau (s)
1,40E-02	3,57E+00
1,10E-02	7,09E-01
8,50E-03	9,74E-02
7,59E-03	2,36E-02
1,51E-03	1,66E-03

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

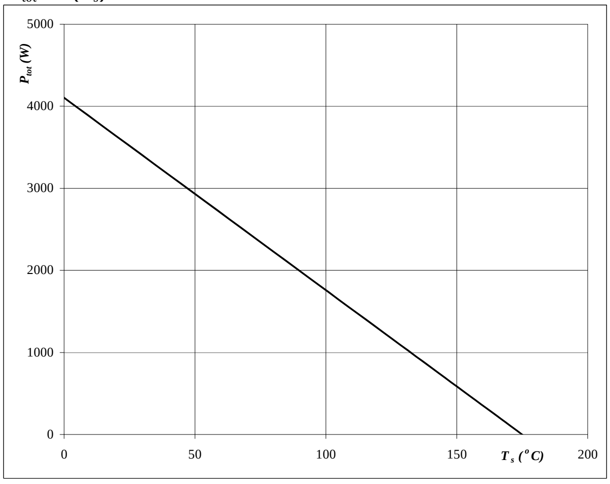
With phase change material

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

$P_{tot} = f(T_s)$



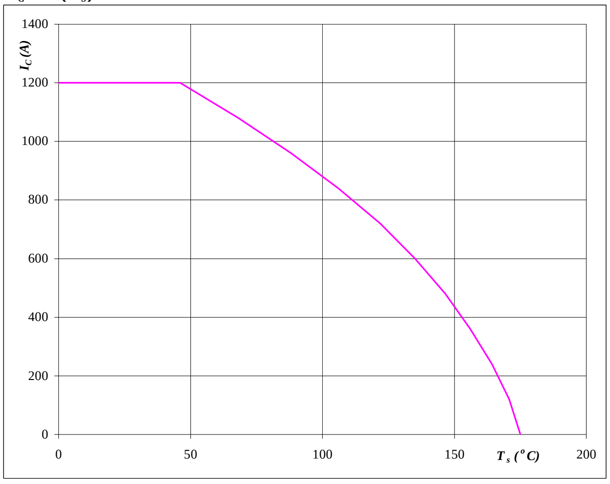
At

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

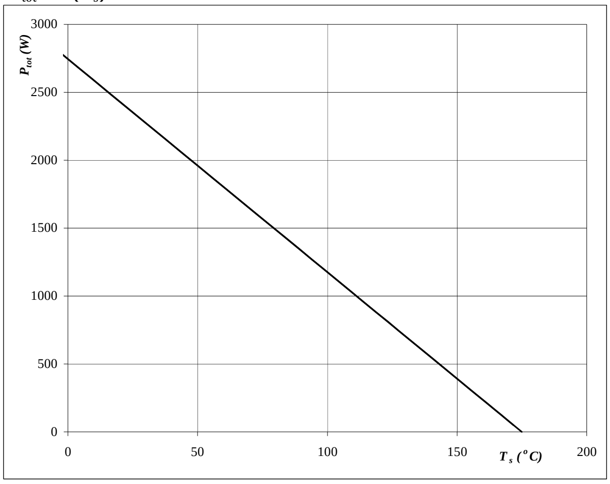
Buck

Buck IGBT and Buck FWD

figure 16 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



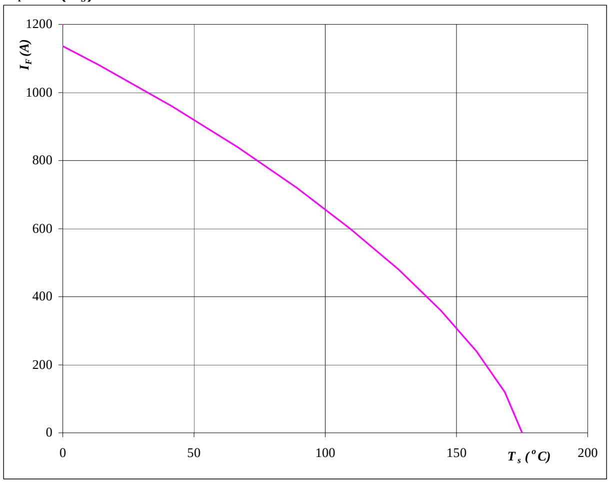
At

T_j = 175 °C

figure 17 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



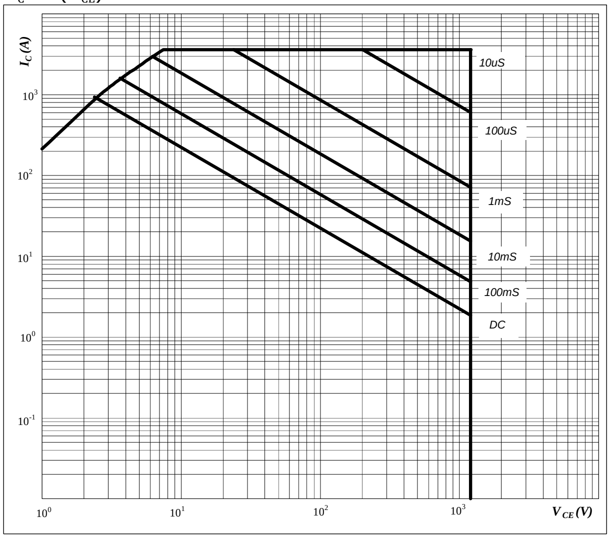
At

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}	

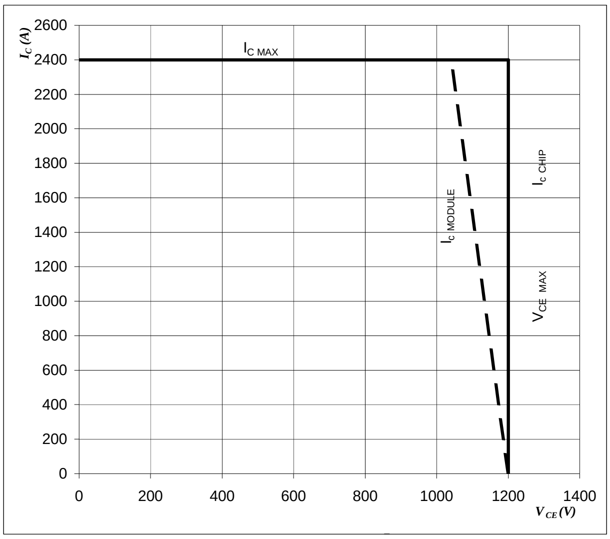
Buck

Buck IGBT and Buck FWD

figure 19	IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

$U_{ccminus} = U_{ccplus}$

Switching mode : 3 level switching

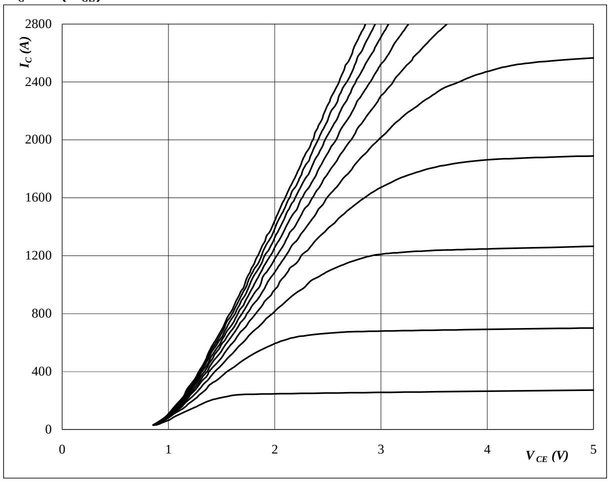
Boost

Boost IGBT and Boost FWD

figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 350 µs

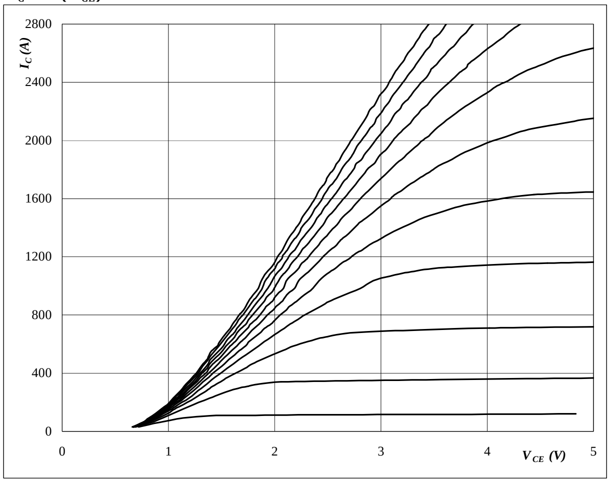
T_j = 25 °C

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

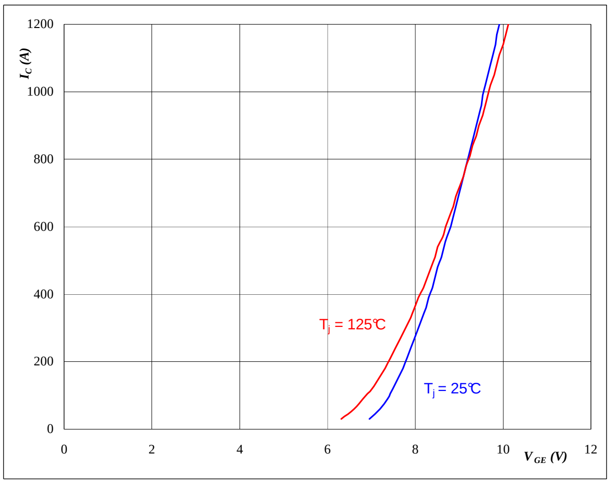
T_j = 125 °C

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

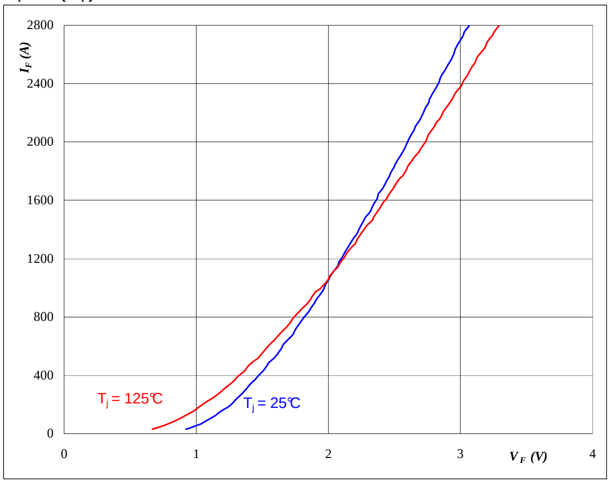
t_p = 350 µs

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

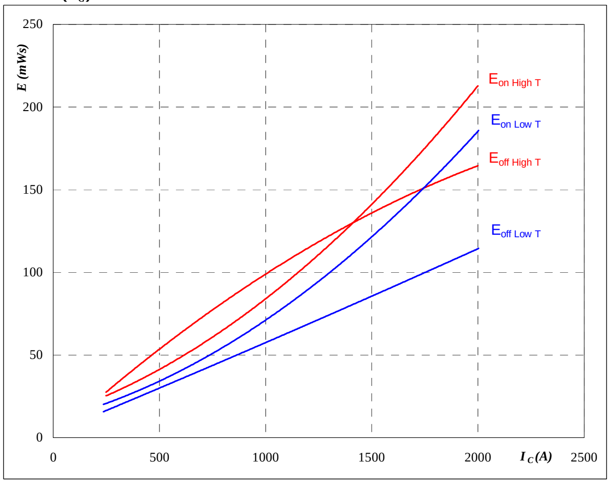
Boost

Boost IGBT and Boost FWD

figure 5 IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



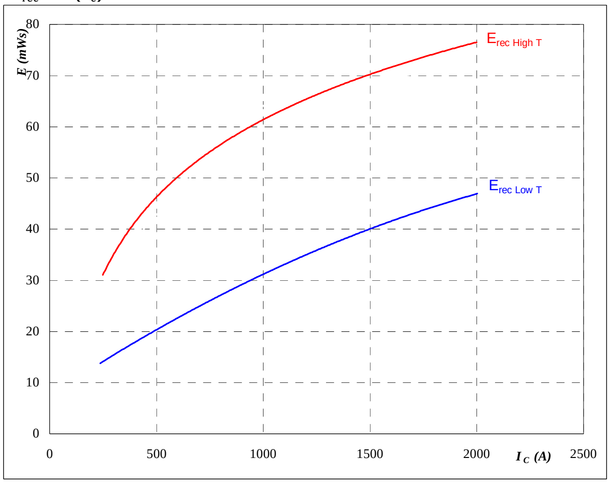
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	+16/ -8	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

$E_{rec} = f(I_c)$



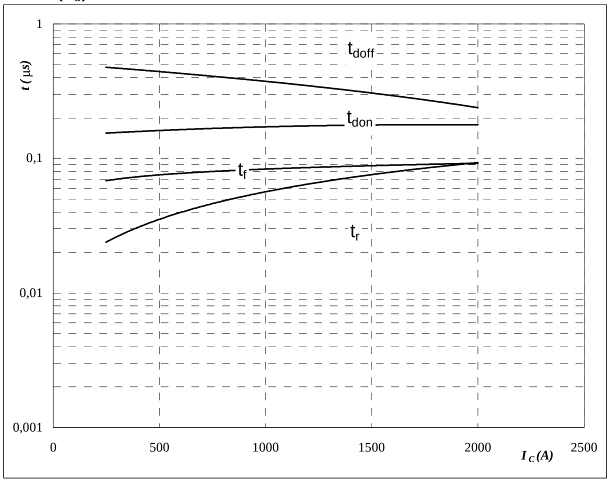
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	+16/ -8	V
R_{gon} =	0,42	Ω

figure 7 IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



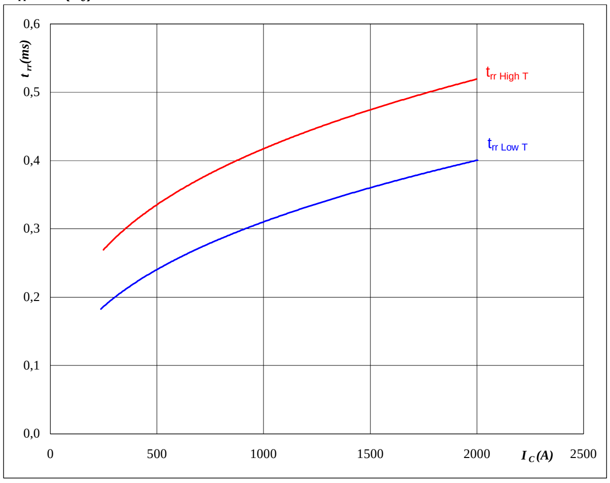
With an inductive load at

T_j =	125	°C	R_{gon} =	0,4	Ω
V_{CE} =	600	V	R_{goff} =	0,4	Ω
V_{GE} =	+16/ -8	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} =	+16/ -8	V
R_{gon} =	0,42	Ω

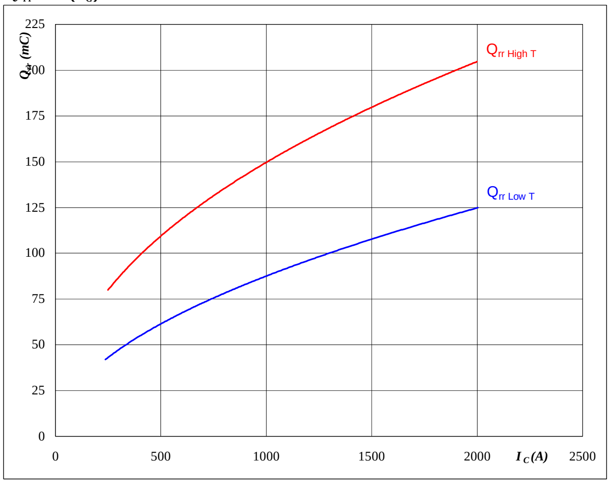
Boost

Boost IGBT and Boost FWD

figure 9	FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



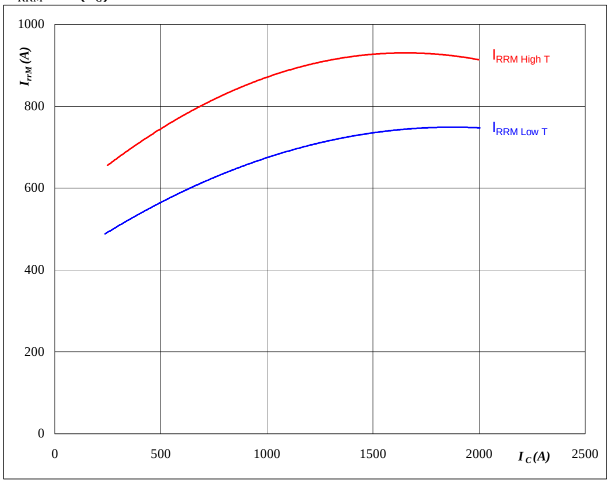
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	+16/ -8	V
R_{gon} =	0,42	Ω

figure 10	FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



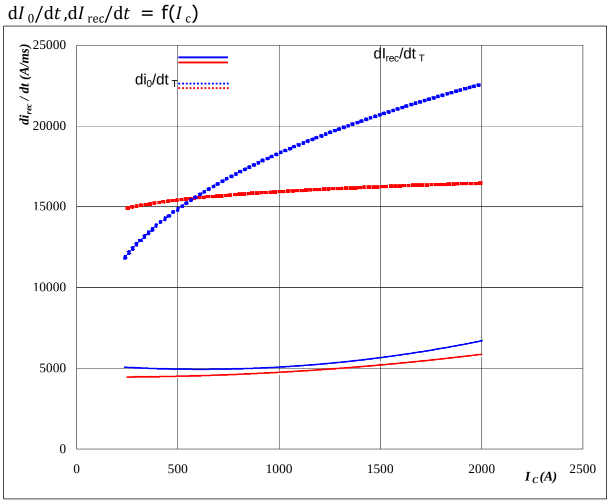
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	+16/ -8	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} =	+16/ -8	V
R_{gon} =	0,42	Ω

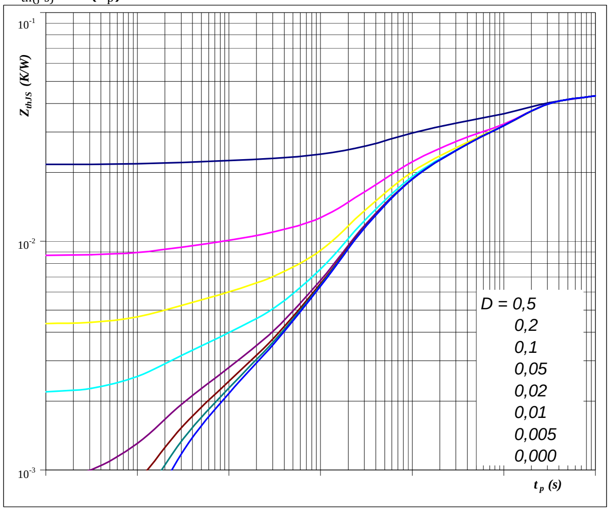
Boost

Boost IGBT and Boost FWD

figure 12 IGBT

IGBT transient thermal impedance as a function of pulse width

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



At

D = t_p / T

IGBT thermal model values with phase-change material

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

IGBT thermal model values

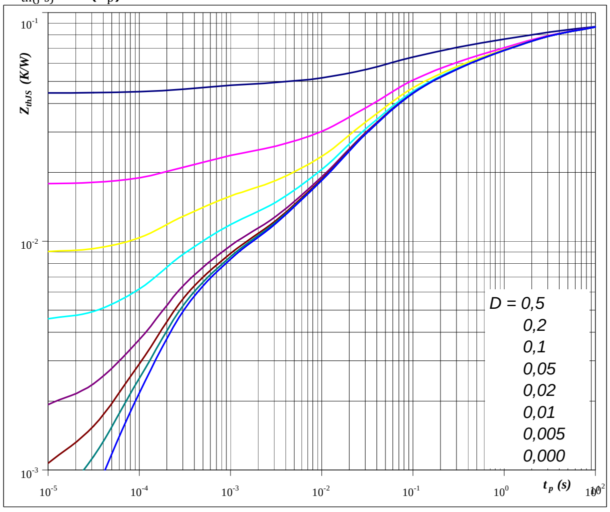
With phase-change material

R (K/W)	Tau (s)
0,020	1,78
0,010	0,17
0,011	0,03
0,001	0,003
0,001	0,0003

figure 13 FWD

FWD transient thermal impedance as a function of pulse width

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



At

D = t_p / T

FWD thermal model values with phase-change material

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

FWD thermal model values

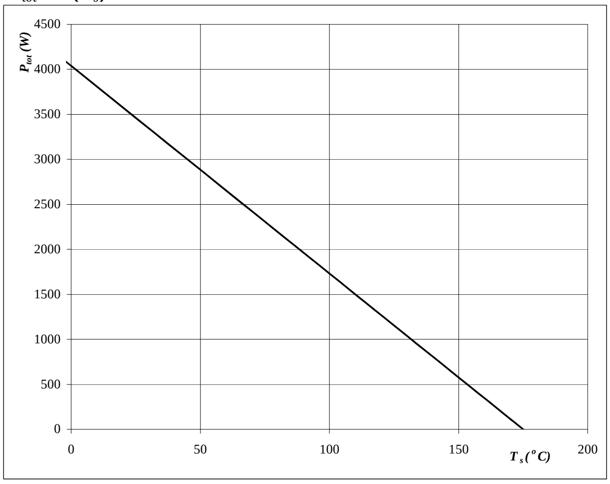
With phase-change material

R (K/W)	Tau (s)
0,014	5,78
0,018	1,38
0,016	0,26
0,022	0,05
0,009	0,02
0,003	0,002
0,006	0,0003

figure 14 IGBT

Power dissipation as a function of heatsink temperature

P_{tot} = f(T_s)



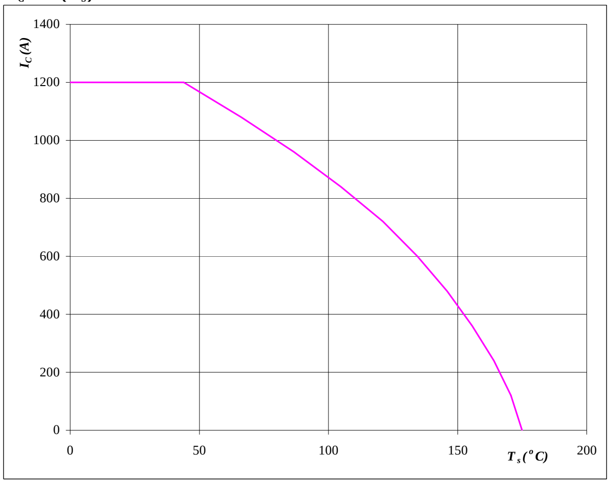
At

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

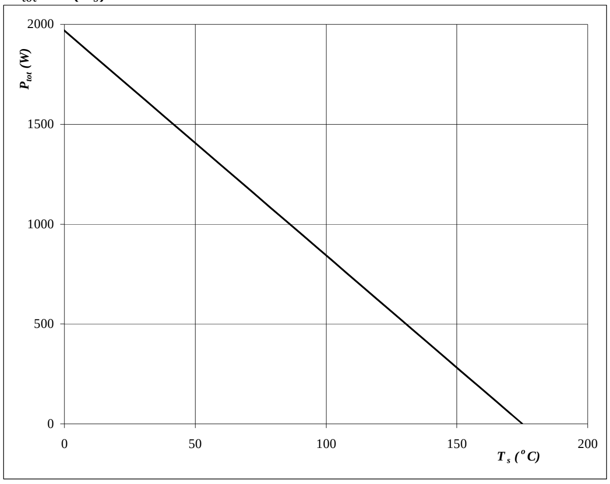
Boost

Boost IGBT and Boost FWD

figure 16	FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



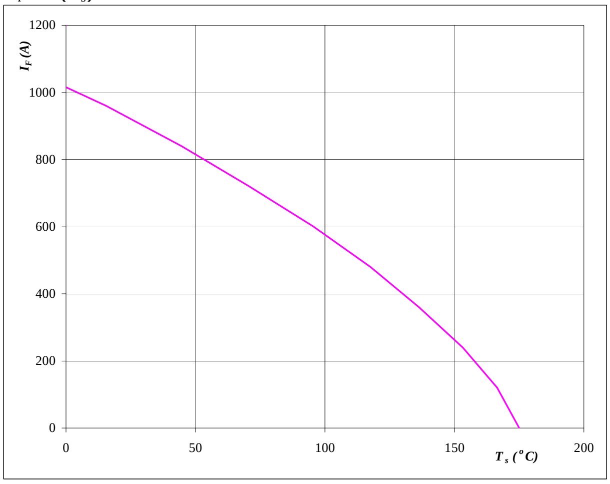
At

T_j = 175 ºC

figure 17	FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



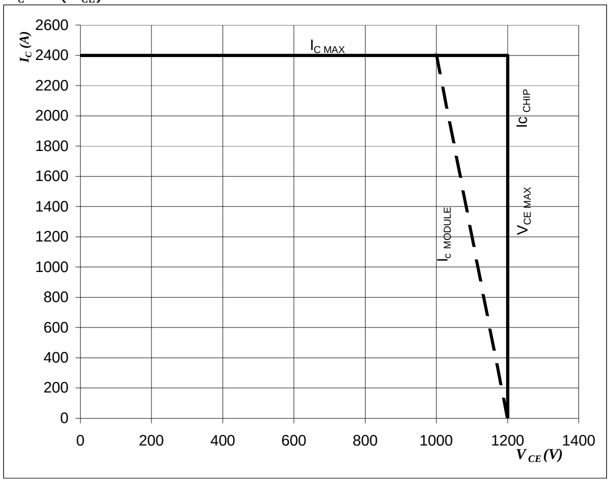
At

T_j = 175 ºC

figure 18	IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

$U_{ccminus} = U_{ccplus}$

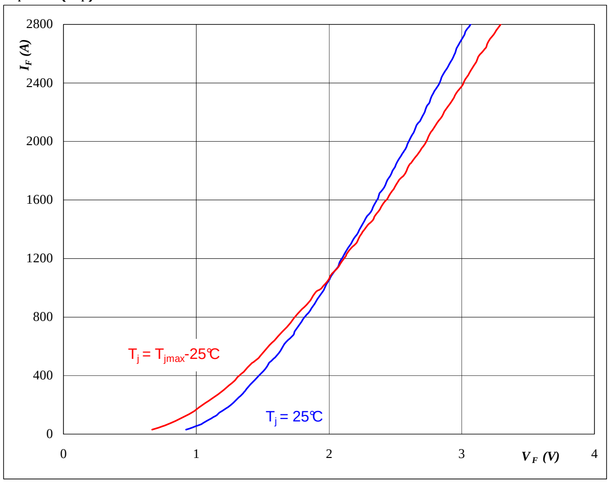
Switching mode : 3 level switching

Boost Inverse Diode

figure 19 Boost Inverse Diode

Typical FWD forward current as a function of forward voltage

$I_F = f(V_F)$



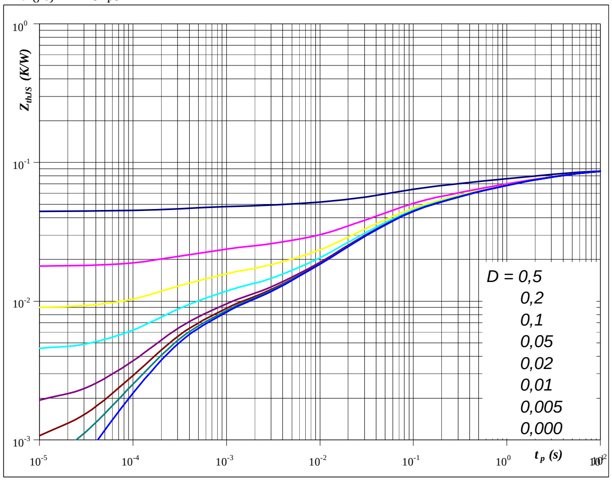
At

t_p = 250 µs

figure 20 Boost Inverse Diode

FWD transient thermal impedance as a function of pulse width

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



At

D = t_p / T

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

FWD thermal model values

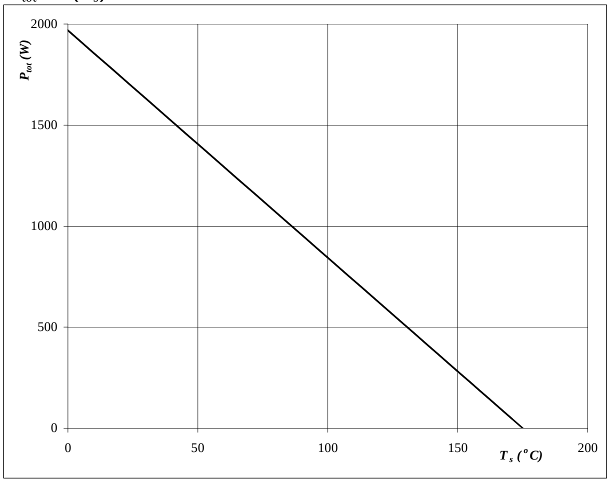
With phase-change material

R (K/W)	Tau (s)
0,014	5,780
0,018	1,375
0,016	0,257
0,022	0,053
0,009	0,016
0,003	0,002
0,006	0,0003

figure 21 Boost Inverse Diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



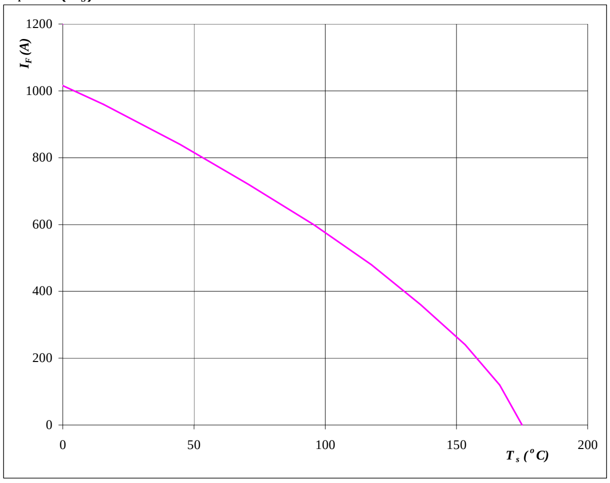
At

T_j = 175 ºC

figure 22 Boost Inverse Diode

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

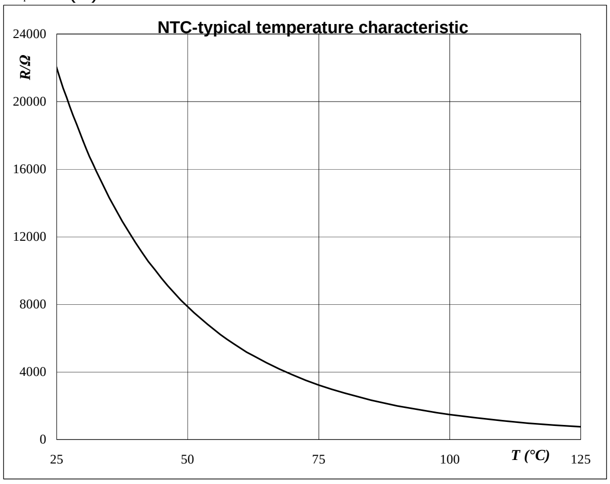
T_j = 175 ºC

Thermistor

figure 1	Thermistor

Typical NTC characteristic
as a function of temperature

R_T = f(T)



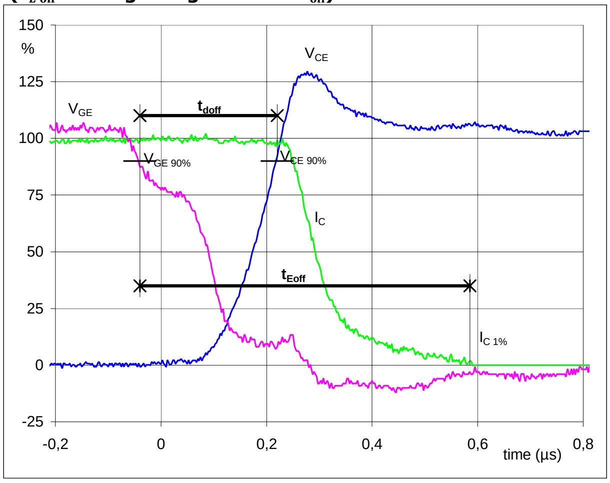
Switching Definitions Buck

General conditions

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

Figure 1 Buck IGBT

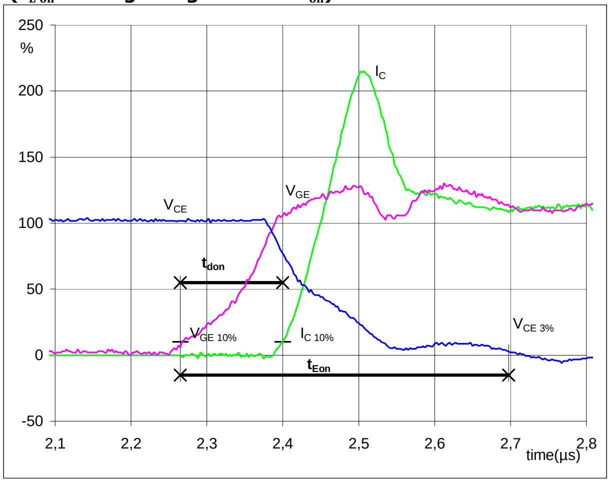
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-8	V
V_{GE} (100%) =	16	V
V_C (100%) =	600	V
I_C (100%) =	1207	A
t_{doff} =	0,26	µs
$t_{E\,off}$ =	0,63	µs

Figure 2 Buck IGBT

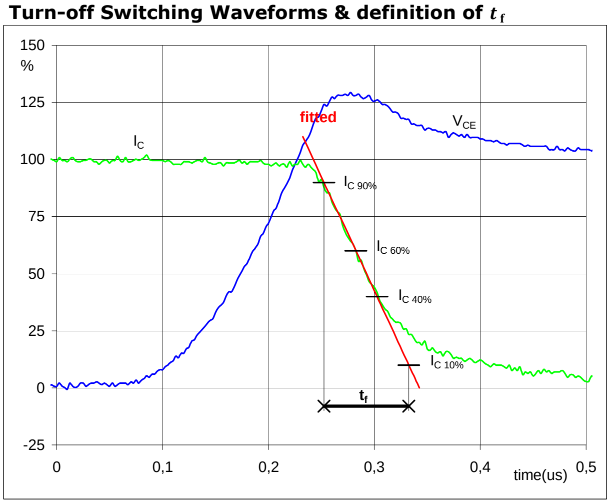
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-8	V
V_{GE} (100%) =	16	V
V_C (100%) =	600	V
I_C (100%) =	1207	A
t_{don} =	0,13	µs
$t_{E\,on}$ =	0,43	µs

Figure 3 Buck IGBT

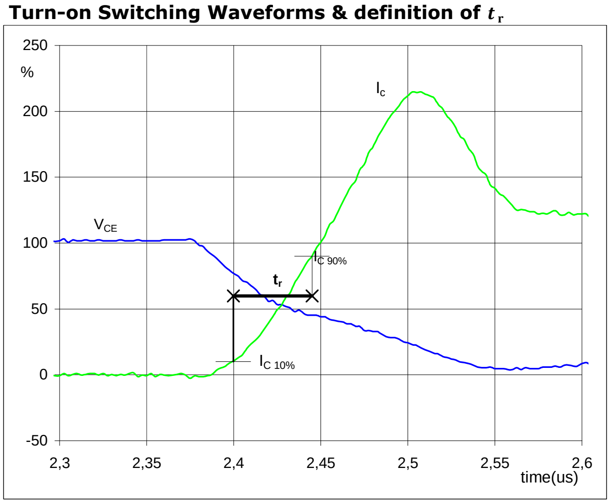
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	1207	A
t_f =	0,09	µs

Figure 4 Buck IGBT

Turn-on Switching Waveforms & definition of t_r

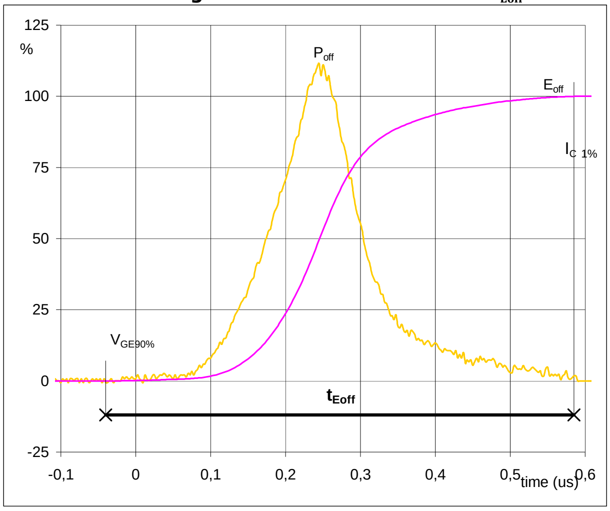


V_C (100%) =	600	V
I_C (100%) =	1207	A
t_r =	0,05	µs

Switching Definitions Buck

Figure 5 Buck IGBT

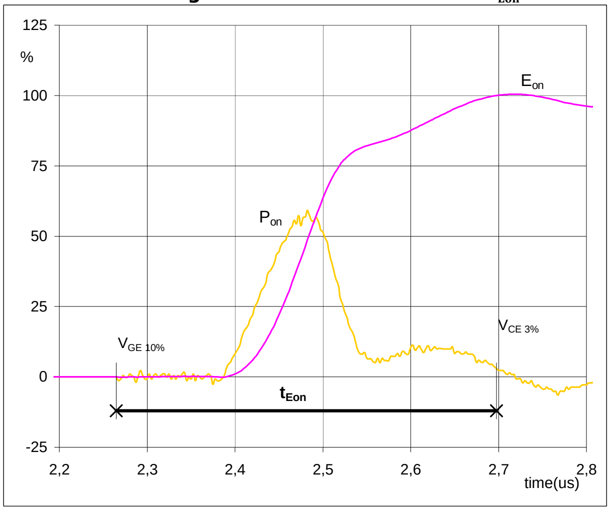
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	723,93	kW
E_{off} (100%) =	117,34	mJ
$t_{E\,off}$ =	0,63	μs

Figure 6 Buck IGBT

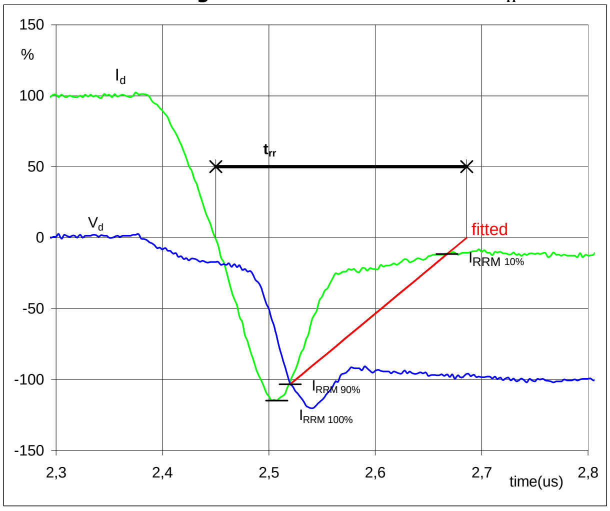
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	723,93	kW
E_{on} (100%) =	46,38	mJ
$t_{E\,on}$ =	0,43	μs

Figure 7 Buck FWD

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

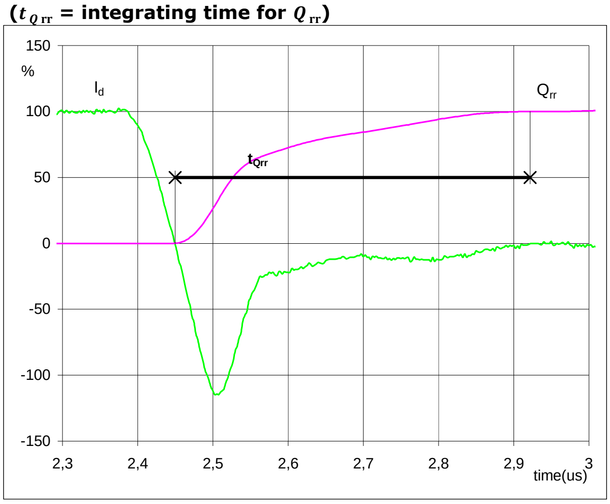


V_d (100%) =	600	V
I_d (100%) =	1207	A
I_{RRM} (100%) =	-1399	A
t_{rr} =	0,23	μs

Switching Definitions Buck

Figure 8 Buck FWD

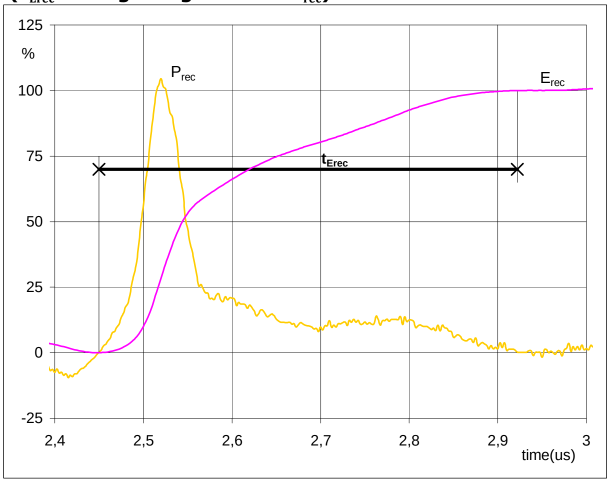
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	1207	A
Q_{rr} (100%) =	141,96	µC
$t_{Q\,rr}$ =	0,47	µs

Figure 9 Buck FWD

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



P_{rec} (100%) =	723,93	kW
E_{rec} (100%) =	67,86	mJ
$t_{E\,rec}$ =	0,47	µs

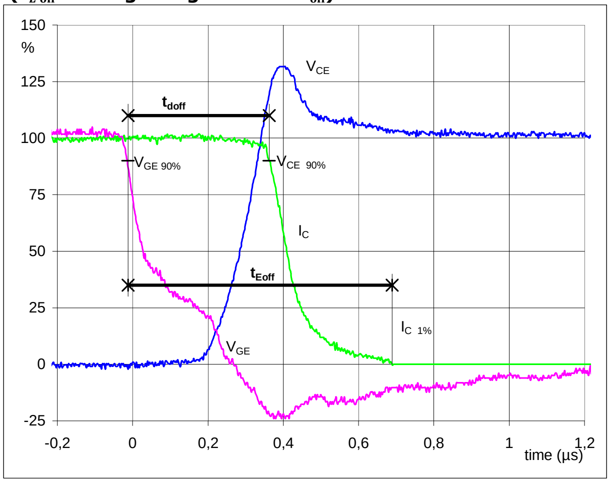
Switching Definitions Boost

General conditions

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

Figure 1 Boost IGBT

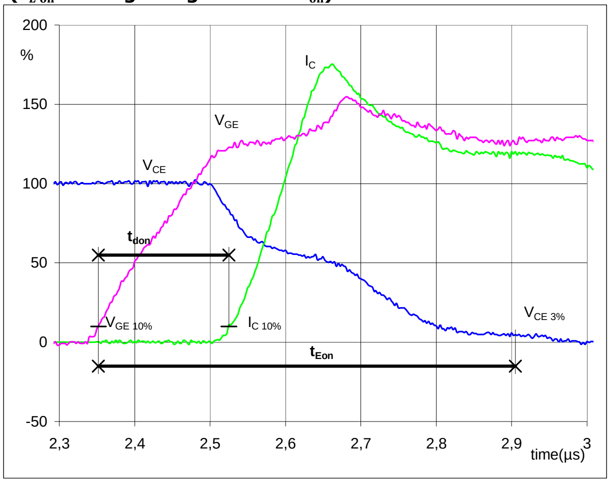
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-8	V
V_{GE} (100%) =	16	V
V_C (100%) =	600	V
I_C (100%) =	1200	A
t_{doff} =	0,34	µs
$t_{E\,off}$ =	0,70	µs

Figure 2 Boost IGBT

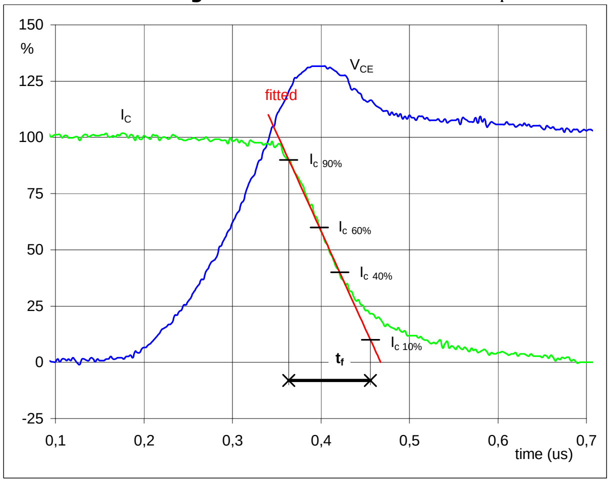
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-8	V
V_{GE} (100%) =	16	V
V_C (100%) =	600	V
I_C (100%) =	1200	A
t_{don} =	0,17	µs
$t_{E\,on}$ =	0,55	µs

Figure 3 Boost IGBT

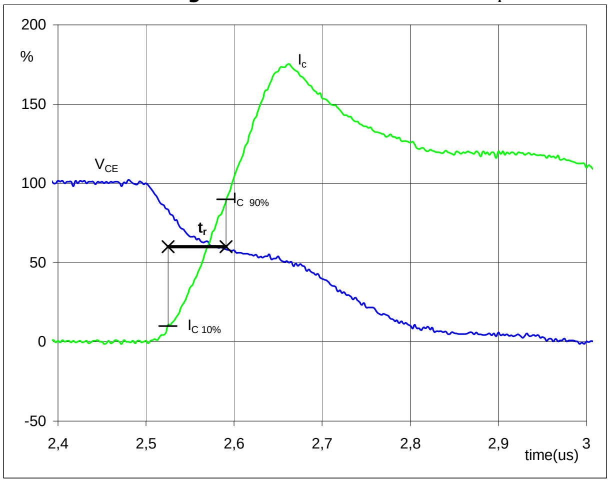
Turn-off Switching Waveforms & definition of t_f



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

Figure 4 Boost IGBT

Turn-on Switching Waveforms & definition of t_r

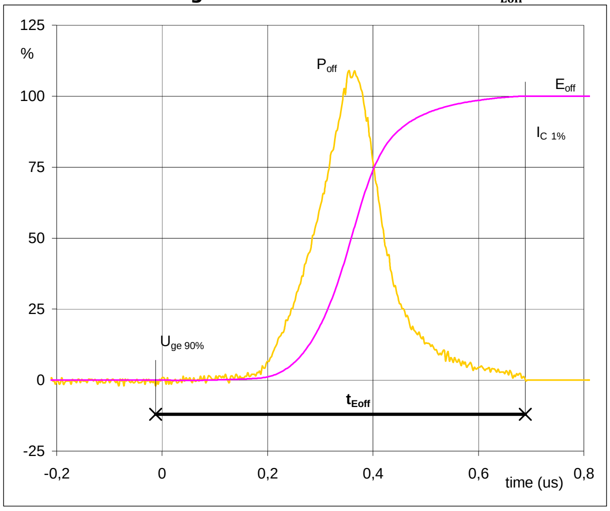


V_C (100%) =	600	V
I_C (100%) =	1200	A
t_r =	0,065	µs

Switching Definitions Boost

Figure 5 Boost IGBT

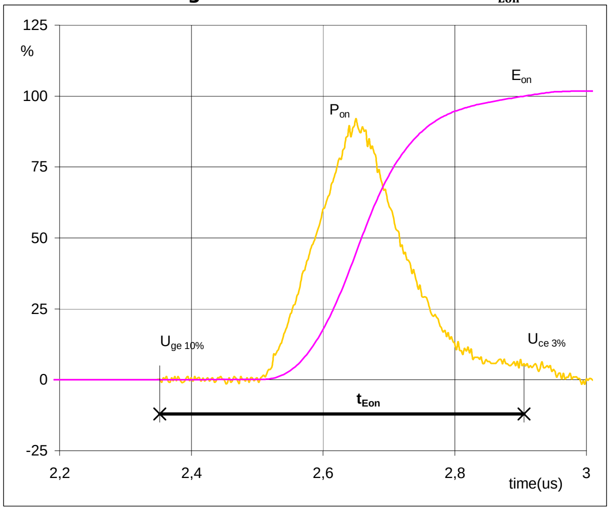
Turn-off Switching Waveforms & definition of t_{Eoff}



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

Figure 6 Boost IGBT

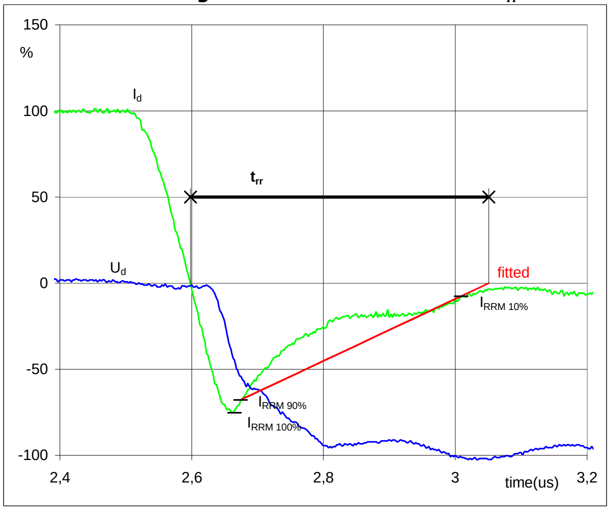
Turn-on Switching Waveforms & definition of t_{Eon}



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

Figure 7 Boost FWD

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

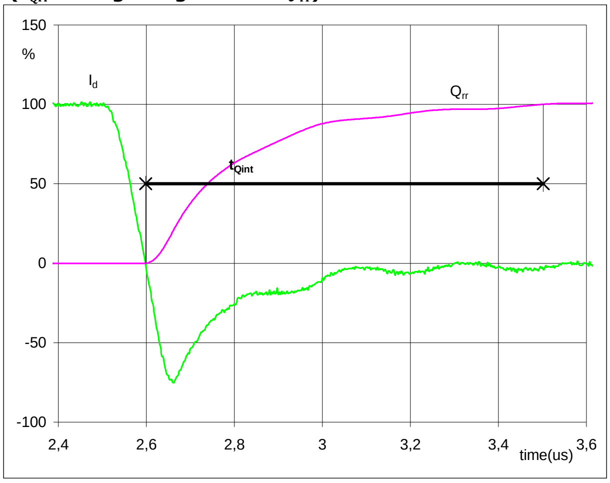


V_d (100%) =	600	V
I_d (100%) =	1200	A
I_{RRM} (100%) =	-903	A
t_{rr} =	0,45	μs

Switching Definitions Boost

Figure 8 Boost FWD

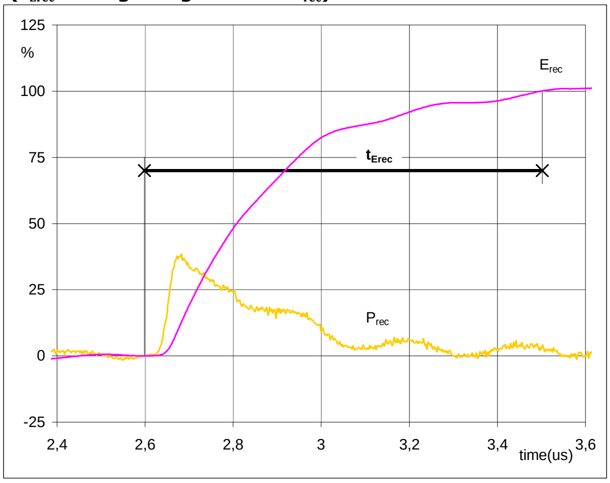
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



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

Figure 9 Boost 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

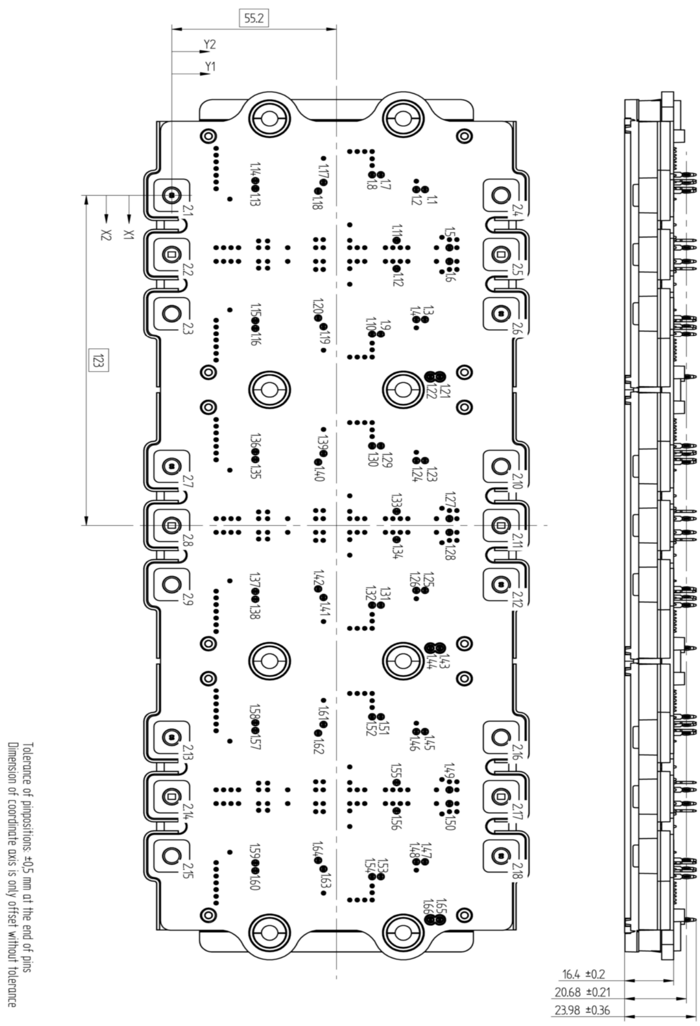
Outline

Driver pins

Pin	X1	Y1	Function	Group
1.1	-2,15	84,85	G1-1	T1
1.2	-2,15	81,95	E1-1	T1
1.3	46,15	84,85	G1-2	T1
1.4	46,15	81,95	E1-2	T1
1.5	19,45	93,05	DC+	desat
1.6	24,55	93,05	DC+	desat
1.7	-7,65	70,05	G2-1	T2
1.8	-7,65	67,15	E2-1	T2
1.9	51,65	70,05	G2-2	T2
1.10	51,65	67,15	E2-2	T2
1.11	16,75	75,35	GND	desat
1.12	27,25	75,35	GND	desat
1.13	-2,55	28	G3-1	T3
1.14	-5,45	28	E3-1	T3
1.15	46,55	28	G3-2	T3
1.16	49,45	28	E3-2	T3
1.17	-4,8	50,85	G4-1	T4
1.18	-1,6	49,05	E4-1	T4
1.19	48,8	50,85	G4-2	T4
1.20	45,6	49,05	E4-2	T4
1.21	67,65	89,8	NTC1	Rt1
1.22	67,65	86,7	NTC2	Rt1
1.23	98,85	84,85	G1-3	T1
1.24	98,85	81,95	E1-3	T1
1.25	147,15	84,85	G1-4	T1
1.26	147,15	81,95	E1-4	T1
1.27	120,45	93,05	DC+	desat
1.28	125,55	93,05	DC+	desat
1.29	93,35	70,05	G2-3	T2
1.30	93,35	67,15	E2-3	T2
1.31	152,65	70,05	G2-4	T2
1.32	152,65	67,15	E2-4	T2
1.33	117,75	75,35	GND	desat
1.34	128,25	75,35	GND	desat
1.35	98,45	28	G3-3	T3
1.36	95,55	28	E3-3	T3
1.37	147,55	28	G3-4	T3
1.38	150,45	28	E3-4	T3
1.39	96,2	50,85	G4-3	T4
1.40	99,4	49,05	E4-3	T4
1.41	149,8	50,85	G4-4	T4
1.42	146,6	49,05	E4-4	T4
1.43	168,65	89,8	NTC1	Rt2
1.44	168,65	86,7	NTC2	Rt2
1.45	199,85	84,85	G1-5	T1
1.46	199,85	81,95	E1-5	T1
1.47	248,15	84,85	G1-6	T1
1.48	248,15	81,95	E1-6	T1
1.49	221,45	93,05	DC+	desat
1.50	226,55	93,05	DC+	desat
1.51	194,35	70,05	G2-5	T2
1.52	194,35	67,15	E2-5	T2
1.53	253,65	70,05	G2-6	T2
1.54	253,65	67,15	E2-6	T2
1.55	218,75	75,35	GND	desat
1.56	229,25	75,35	GND	desat
1.57	199,45	28	G3-5	T3
1.58	196,55	28	E3-5	T3
1.59	248,55	28	G3-6	T3
1.60	251,45	28	E3-6	T3
1.61	197,2	50,85	G4-5	T4
1.62	200,4	49,05	E4-5	T4
1.63	250,8	50,85	G4-6	T4

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	110,41	DC+
2.5	22	110,41	GND
2.6	44	110,41	DC-
2.7	101	0	Phase
2.8	123	0	Phase
2.9	145	0	Phase
2.10	101	110,41	DC+
2.11	123	110,41	GND
2.12	145	110,41	DC-
2.13	202	0	Phase
2.14	224	0	Phase
2.15	246	0	Phase
2.16	202	110,41	DC+
2.17	224	110,41	GND
2.18	246	110,41	DC-



Driver pins

Pin	X1	Y1	Function	Group
1.64	247,6	49,05	E4-6	T4
1.65	269,7	89,8	NTC1	Rt3
1.66	269,7	86,7	NTC2	Rt3

Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

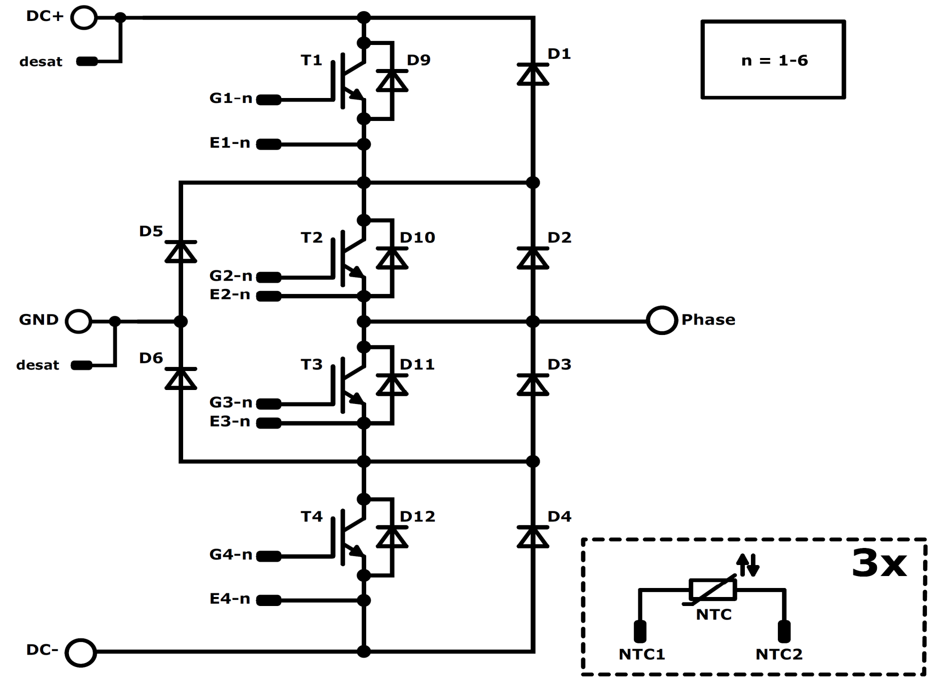
Version	Ordering Code
Standard	70-W624N3A1K2SC01-L400FP10
Standard with thermal paste	70-W624N3A1K2SC01-L400FP10-/3/

Name
Date code
Lot
Serial
Vincotech UL

	Name	Date code	UL & Vinco	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-NNNNNNNN	WWYY	UL VIN	LLLLL	SSSS

	Type&Ver	Lot number	Serial	Date code		
Datamatrix	TTTT-TTT	LLLLL	SSSS	WWYY		

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1, T4	IGBT	1200 V	1200 A	Buck Switch	
D5, D6	FWD	1200 V	1200 A	Buck Diode	
T2, T3	IGBT	1200 V	1200 A	Boost Switch	
D1, D4	FWD	1200 V	900 A	Boost Diode	
D2, D3	FWD	1200 V	900 A	Boost Inverse Diode	
D9, D12	FWD	1200 V	90 A	Buck sw. Prot. Diode	
D10, D11	FWD	1200 V	90 A	Boost sw. Prot. Diode	
NTC	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ)	>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.

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-W624N3B1K2SC01-L400FP23-D6-14	10 Jul. 2019	Marketing application voltage modified	1