flowNPC 0	NPC Application	600V/60A & 99mΩ PS*

General conditions

BUCK		
V_{GEon}	=	+ 15 V
V_{GEoff}	=	- 15 V
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

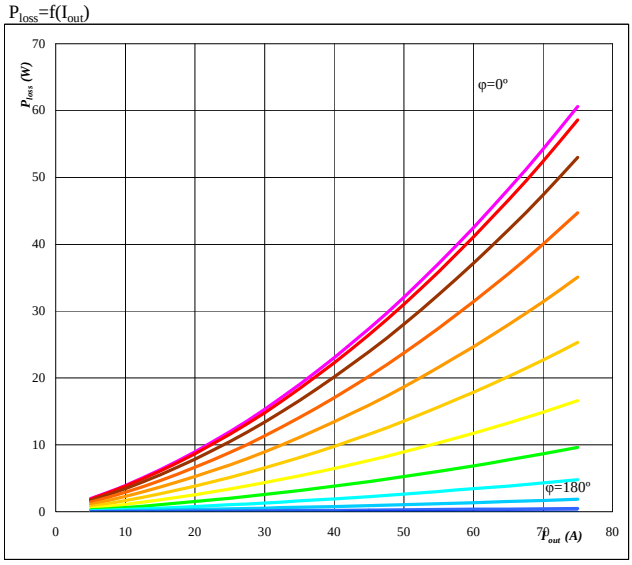
V_{out}= 230 V_{AC}

BOOST		
V_{GEon}	=	15 V
V_{GEoff}	=	0 V
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

Figure 1. Buck MOSFET

Typical average static loss as a function of of output current I_{oRMS}

$P_{loss}=f(I_{out})$

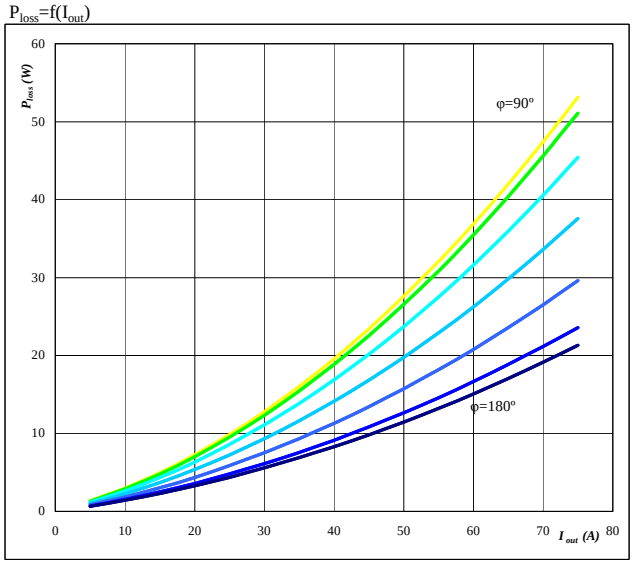


Conditions: T_j= 125 °C
parameter: φ from 0° to 180°
in 12 steps

Figure 2. Buck FWD

Typical average static loss as a function of output current I_{oRMS}

$P_{loss}=f(I_{out})$

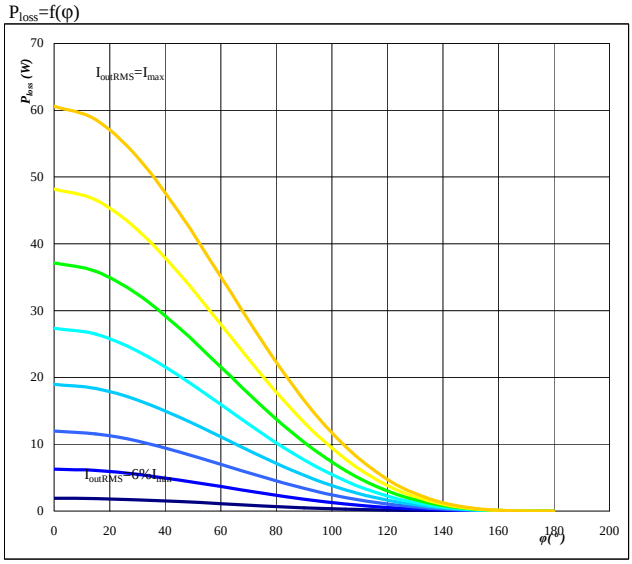


Conditions: T_j= 125 °C
parameter: φ from 0° to 180°
in 12 steps

Figure 3. Buck MOSFET

Typical average static loss as a function of phase displacement φ

$P_{loss}=f(\varphi)$

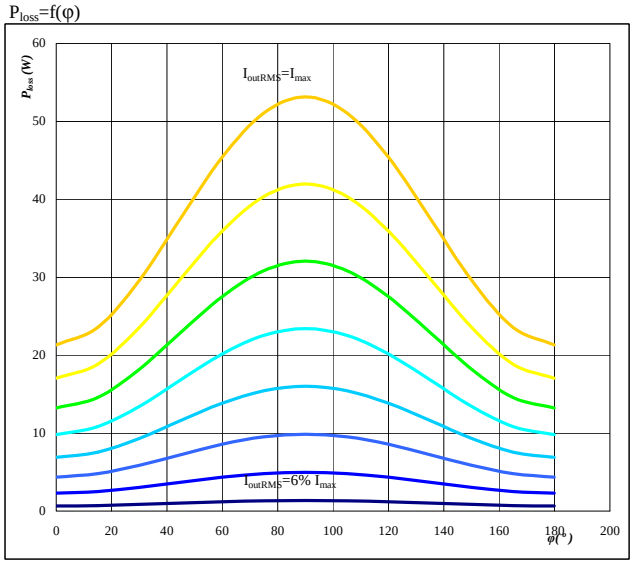


Conditions: T_j= 125 °C
parameter: I_{oRMS} from 5 A to 75 A
in steps of 10 A

Figure 4. Buck FWD

Typical average static loss as a function of phase displacement φ

$P_{loss}=f(\varphi)$

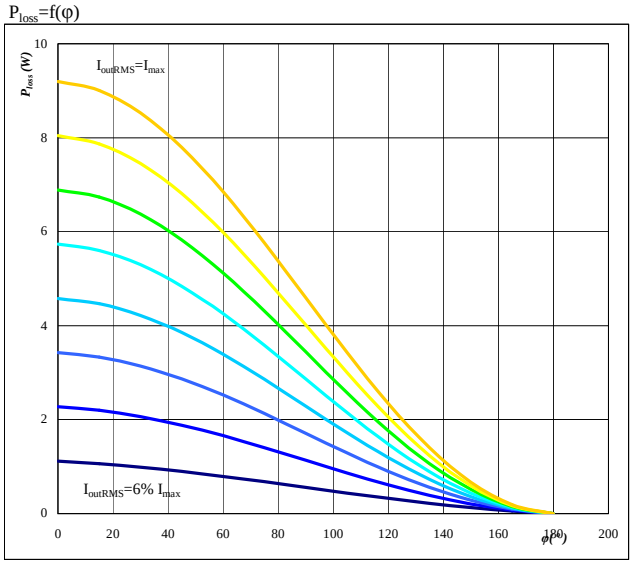


Conditions: T_j= 125 °C
parameter: I_{oRMS} from 5 A to 75 A
in steps of 10 A

Figure 5. Buck MOSFET

Typical average switching loss as a function of phase displacement φ

$P_{loss}=f(\varphi)$



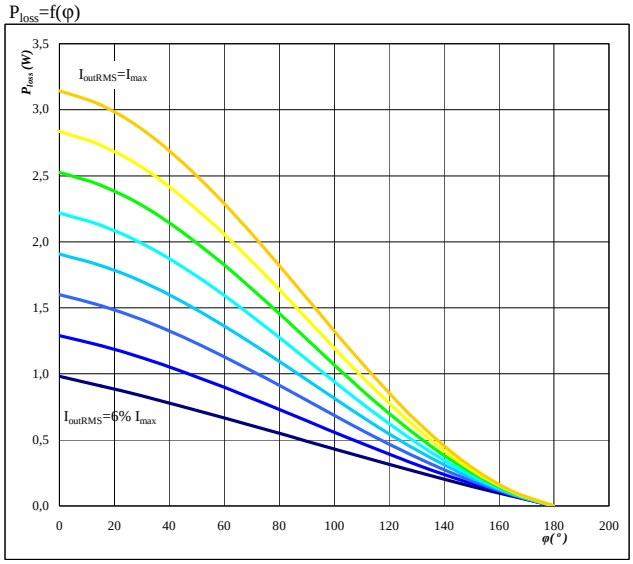
Conditions:

	T_j=	125	°C
	f_{sw}=	20	kHz
	DC link=	700	V
parameter:	I_{oRMS}	from 5 A	to 75 A
		in steps of 10	A

Figure 6. Buck FWD

Typical average switching loss as a function of phase displacement φ

$P_{loss}=f(\varphi)$



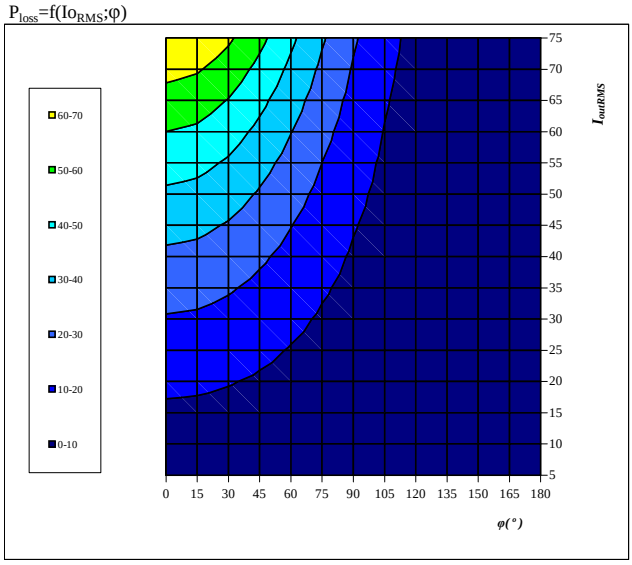
Conditions:

	T_j=	125	°C
	f_{sw}=	20	kHz
	DC link=	700	V
parameter:	I_{oRMS}	from 5 A	to 75 A
		in steps of 10	A

Figure 7. Buck MOSFET

Typical total loss as a function of phase displacement φ and output current I_{oRMS}

$P_{loss}=f(Io_{RMS};\varphi)$



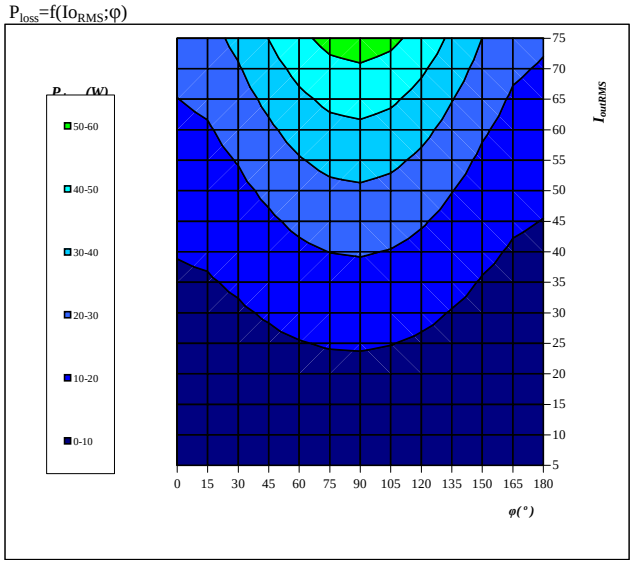
Conditions:

	T_j=	125	°C
	DC link=	700	V
	f_{sw}=	20	kHz

Figure 8. Buck FWD

Typical total loss as a function of phase displacement φ and output current I_{oRMS}

$P_{loss}=f(Io_{RMS};\varphi)$



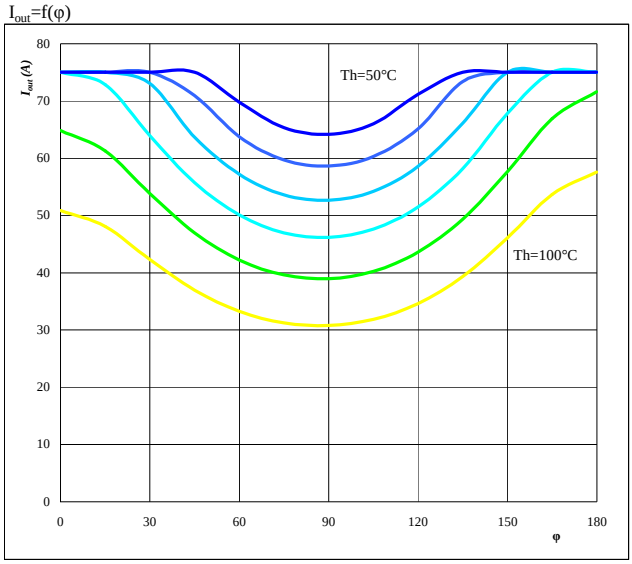
Conditions:

	T_j=	125	°C
	DC link=	700	V
	f_{sw}=	20	kHz

Figure 9. for Buck MOSFET+FWD

Typical available output current as a function of phase displacement φ

$I_{out}=f(\varphi)$

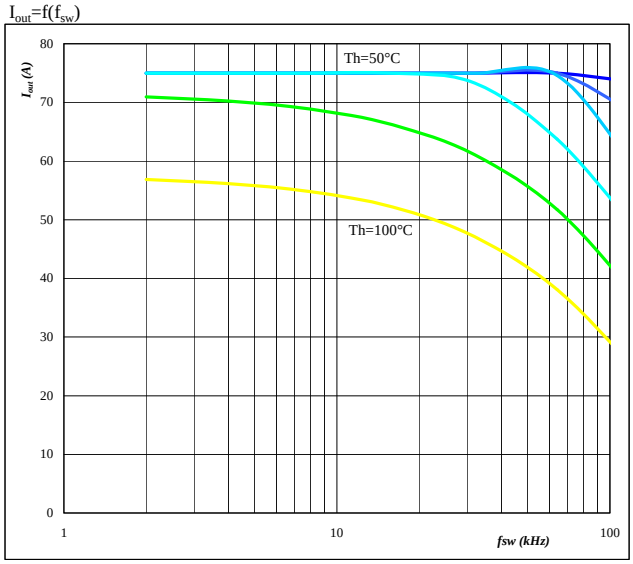


Conditions:	T_j=	Tjmax-25	°C	f_{sw}=	20	kHz
	DC link=	700	V			
parameter:	Heatsink temp.					
	T_h from	50	°C to	100	°C	
	in	10	°C	steps		

Figure 10. for Buck MOSFET+FWD

Typical available output current as a function of switching frequency f_{sw}

$I_{out}=f(f_{sw})$

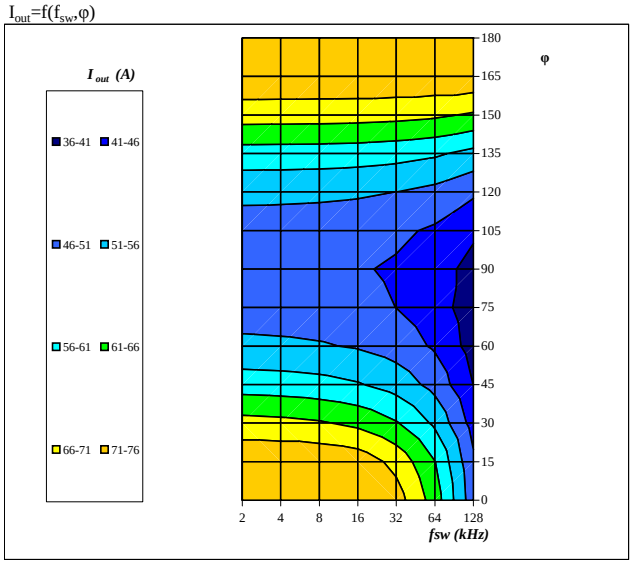


Conditions:	T_j=	Tjmax-25	°C	φ=	0	°
	DC link=	700	V			
parameter:	Heatsink temp.					
	T_h from	50	°C to	100	°C	
	in	10	°C	steps		

Figure 11. for Buck IGBT+FWD

Typical available 50Hz output current as a function of fsw and phase displacement φ

$I_{out}=f(f_{sw},\varphi)$

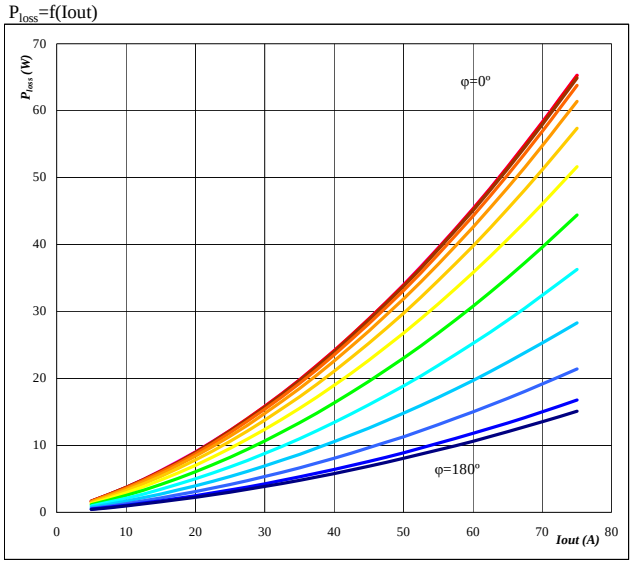


Conditions:	T_j=	Tjmax-25	°C
	DC link=	700	V
	T_h=	80	°C

Figure 12. Boost IGBT

Typical average static loss as a function of output current

$P_{loss}=f(Iout)$

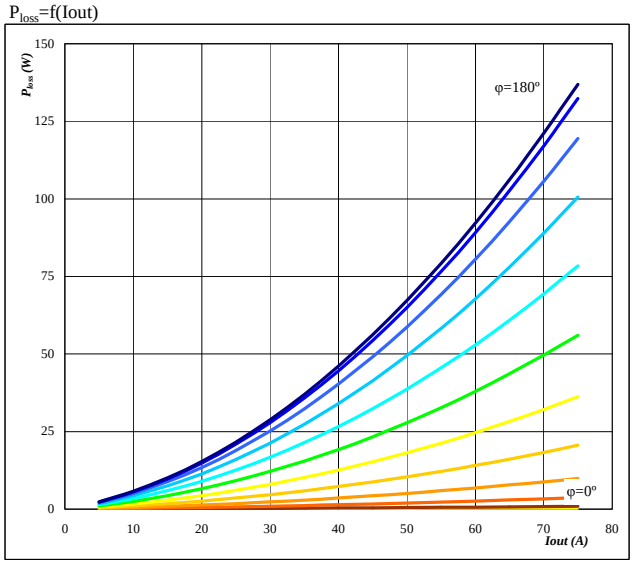


Conditions: T_j= 125 °C
parameter: **φ** from 0° to 180°
in 12 steps

Figure 13. Boost FWD

Typical average static loss as a function of output current

$P_{loss}=f(Iout)$

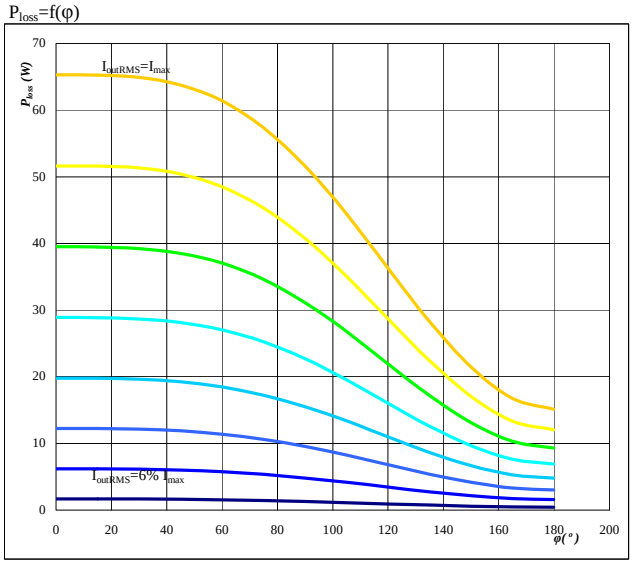


Conditions: T_j= 125 °C
parameter: **φ** from 0° to 180°
in 12 steps

Figure 14. Boost IGBT

Typical average static loss as a function of phase displacement

$P_{loss}=f(\varphi)$

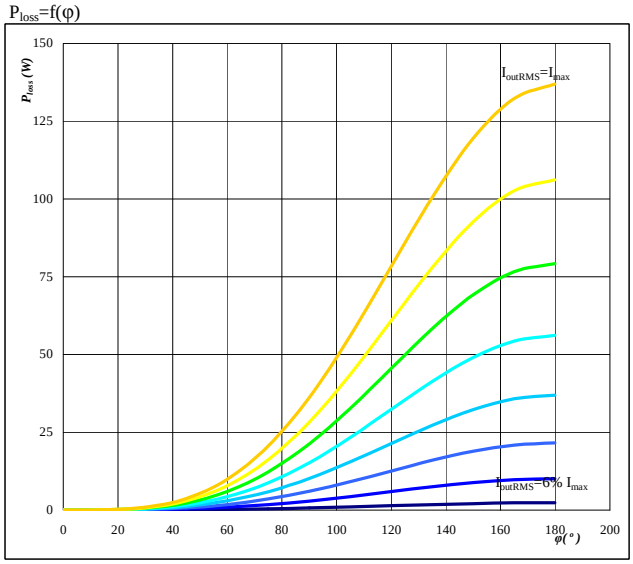


Conditions: T_j= 125 °C
parameter: I_{oRMS} from 5 A to 75 A
in steps of 10 A

Figure 15. Boost FWD

Typical average static loss as a function of phase displacement

$P_{loss}=f(\varphi)$

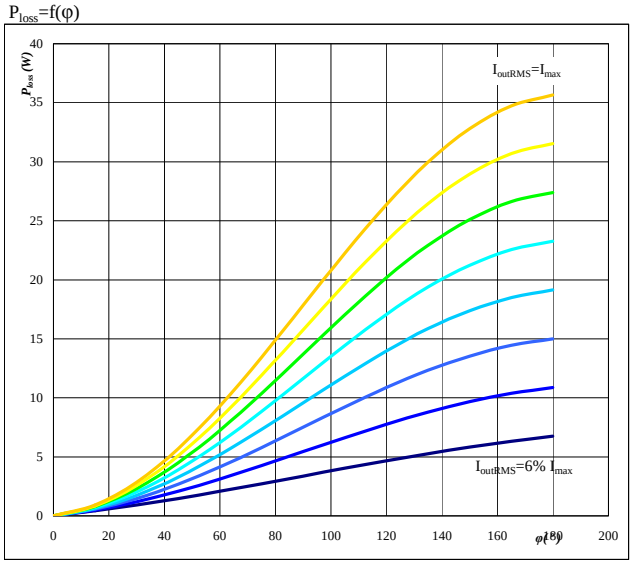


Conditions: T_j= 125 °C
parameter: I_{oRMS} from 5 A to 75 A
in steps of 10 A

Figure 16. Boost IGBT

Typical average switching loss as a function of phase displacement

$P_{loss}=f(\varphi)$

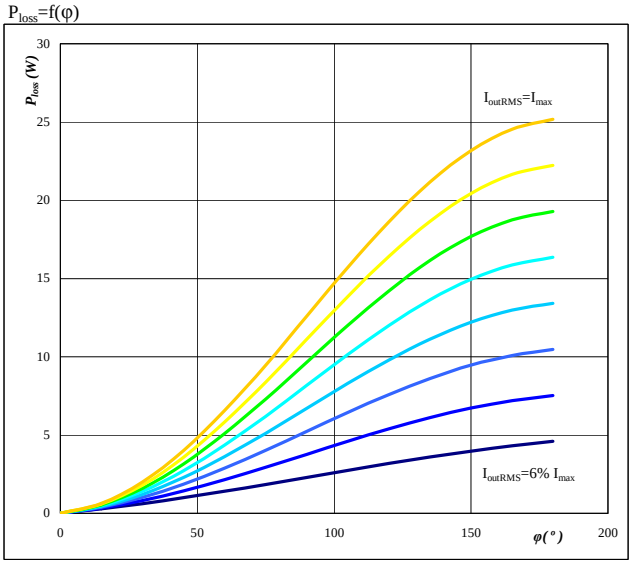


Conditions:	T_j=	125	°C	f_{sw}=	20	kHz
	DC link=	700	V			
parameter:	I_{oRMS}	from	5 A	to	75 A	
		in steps of	10 A	A		

Figure 17. Boost FWD

Typical average switching loss as a function of phase displacement

$P_{loss}=f(\varphi)$

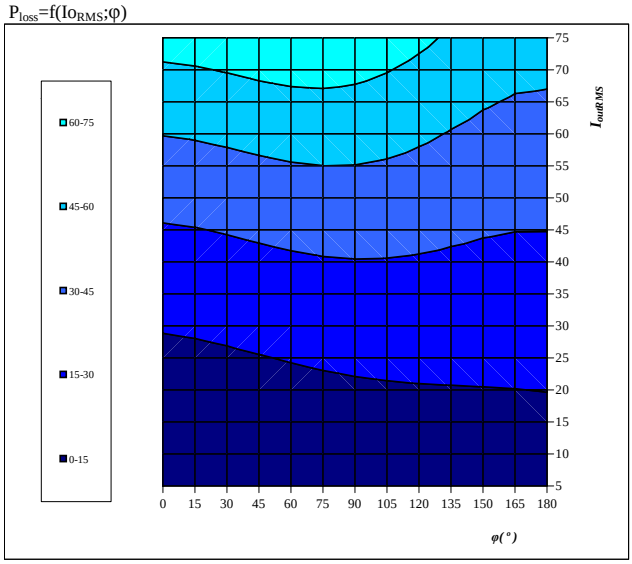


Conditions:	T_j=	125	°C	f_{sw}=	20	kHz
	DC link=	700	V			
parameter:	I_{oRMS}	from	5 A	to	75 A	
		in steps of	10 A	A		

Figure 18. Boost IGBT

Typical total loss as a function of phase displacement and $Iout_{RMS}$

$P_{loss}=f(Io_{RMS};\varphi)$

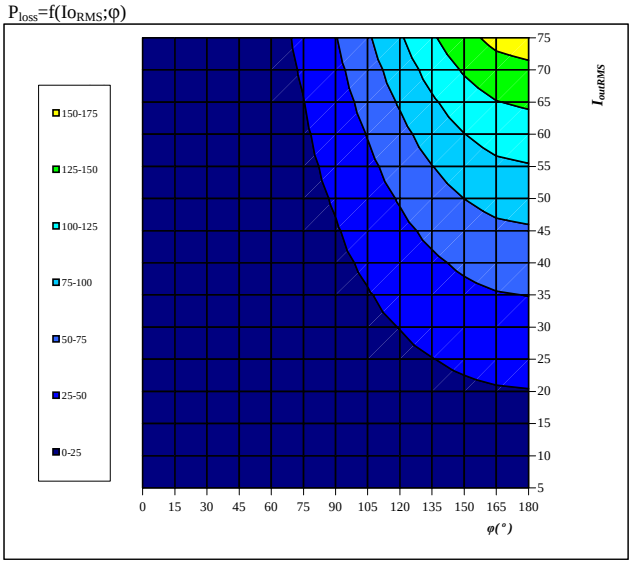


Conditions:	T_j=	125	°C
	DC link=	700	V
	f_{sw}=	20	kHz

Figure 19. Boost FWD

Typical total loss as a function of phase displacement and $Iout_{RMS}$

$P_{loss}=f(Io_{RMS};\varphi)$

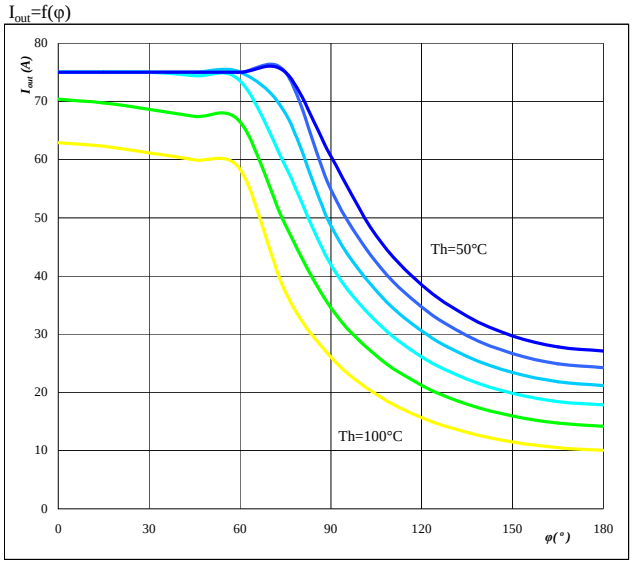


Conditions:	T_j=	125	°C
	DC link=	700	V
	f_{sw}=	20	kHz

Figure 20. Boost IGBT+FWD

Typical available output current as a function of of phase displacement

$I_{out}=f(\varphi)$

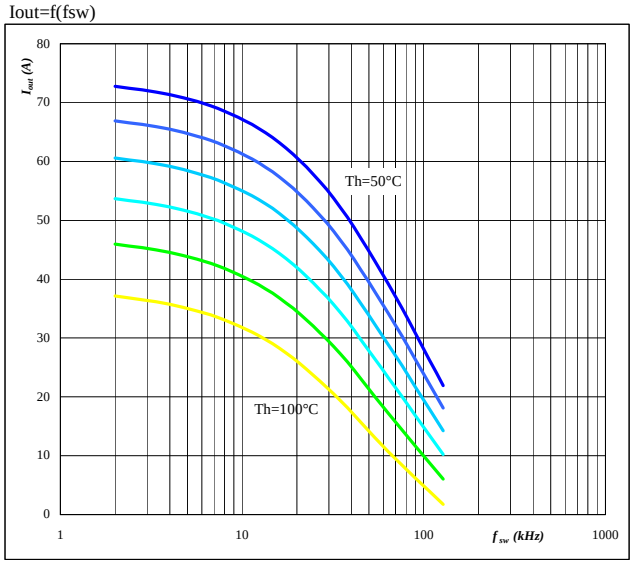


Conditions:	T_j=	Tjmax-25	°C		f_{sw}=	20 kHz
	DC link=	700	V			
parameter:	Heatsink temp.					
	Th from	50	°C to	100		°C
	in	10	°C	steps		

Figure 21. Boost IGBT+FWD

Typical available output current as a function of switching frequency

Iout=f(fsw)

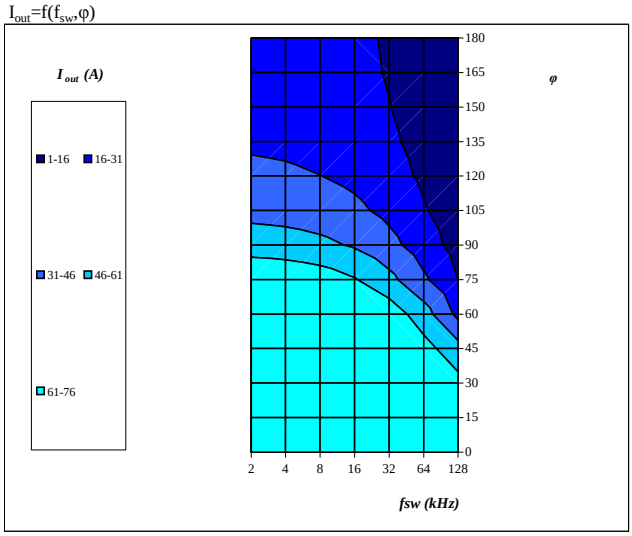


Conditions:	T_j=	Tjmax-25	°C		φ=	90°
	DC link=	700	V			
parameter:	Heatsink temp.					
	Th from	50	°C to	100		°C
	in	10	°C	steps		

Figure 22. Boost IGBT+FWD

Typical available 50Hz output current as a function of fsw and phase displacement

$I_{out}=f(f_{sw},\varphi)$

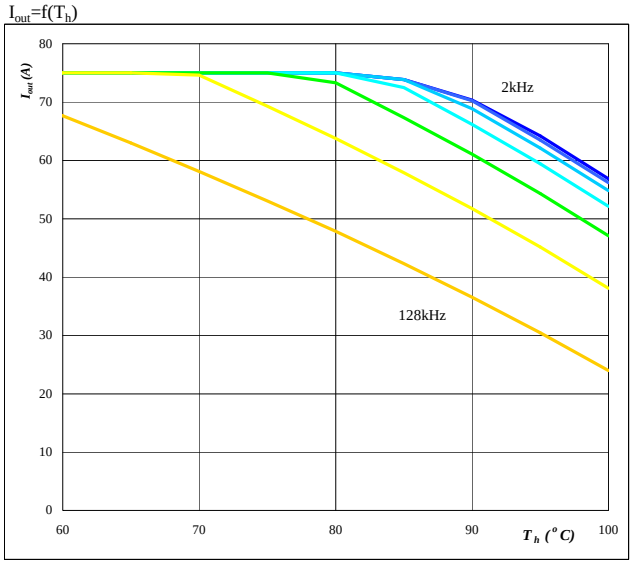


Conditions:	T_j=	Tjmax-25	°C
	DC link=	700	V
	T_h=	80	°C

Figure 23. per MODULE

Typical available output current as a function of heat sink temperature

$I_{out}=f(T_h)$

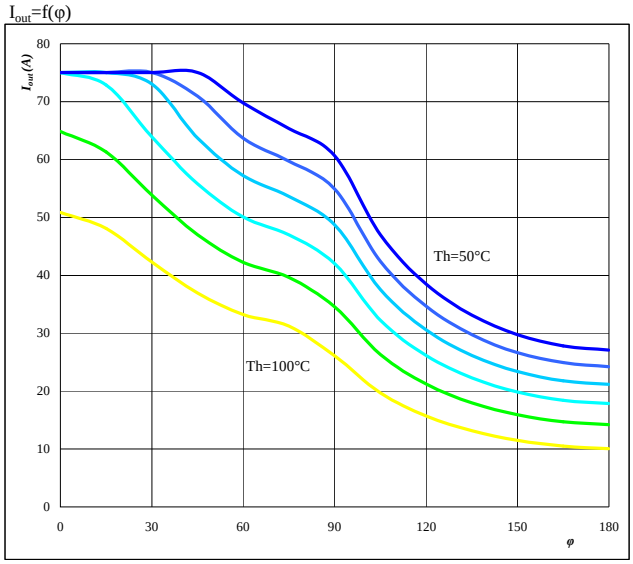


Conditions:	T_j=	Tjmax-25	°C	
	DC link=	700	V	
	φ=	0 °		
parameter:	Switching freq.			
	fsw from	2	kHz to	128 kHz
	in steps of factor 2			

Figure 24. per MODULE

Typical available output current as a function of phase displacement

$I_{out}=f(\varphi)$

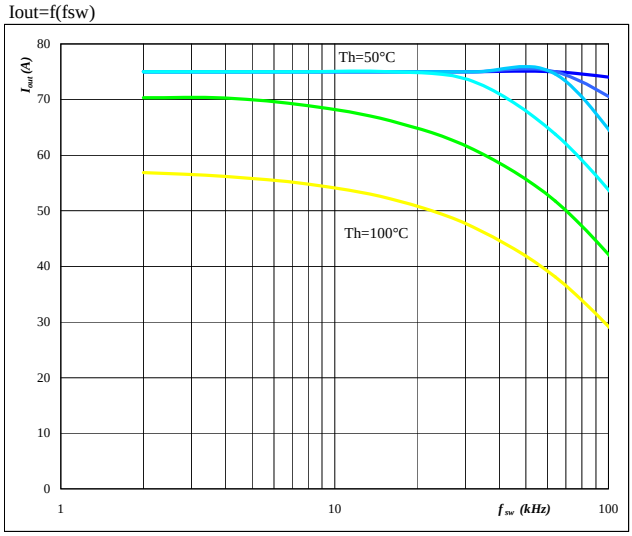


Conditions:	T_j=	Tjmax-25	°C	
	DC link=	700	V	
	f_{sw}=	20	kHz	
parameter:	Heatsink temp.			
	Th from	50	°C to	100
	in	10	°C	steps

Figure 25. per MODULE

Typical available output current as a function of switching frequency

Iout=f(fsw)

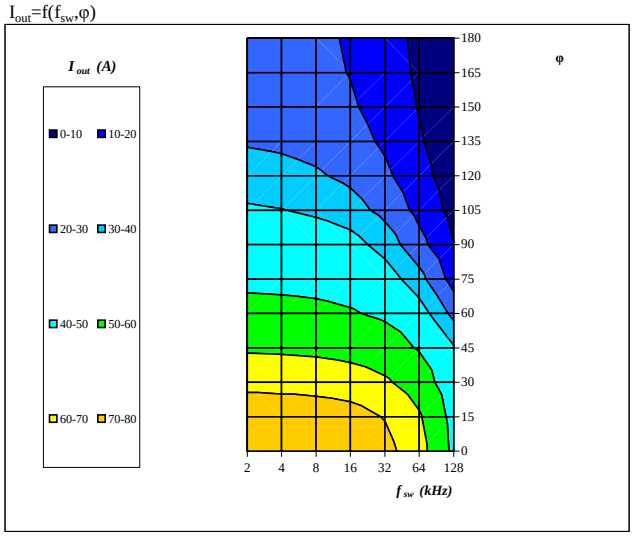


Conditions:	T_j=	Tjmax-25	°C	φ=	0 °	
	DC link=	700	V			
parameter:	Heatsink temp.					
	Th from	50	°C to	100		
	in	10	°C	steps		

Figure 26. per MODULE

Typical available 50Hz output current as a function of fsw and phase displacement

$I_{out}=f(f_{sw},\varphi)$

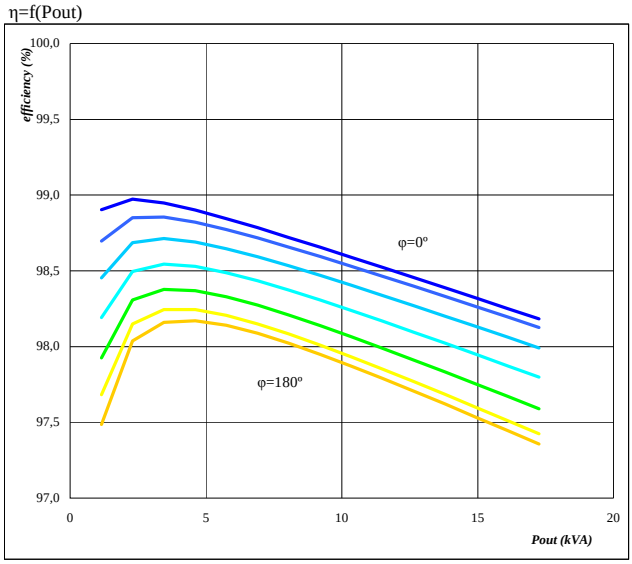


Conditions:	T_j=	Tjmax-25	°C
	DC link=	700	V
	T_h=	80	°C

Figure 27. per MODULE

Typical efficiency as a function of output power

η=f(Pout)

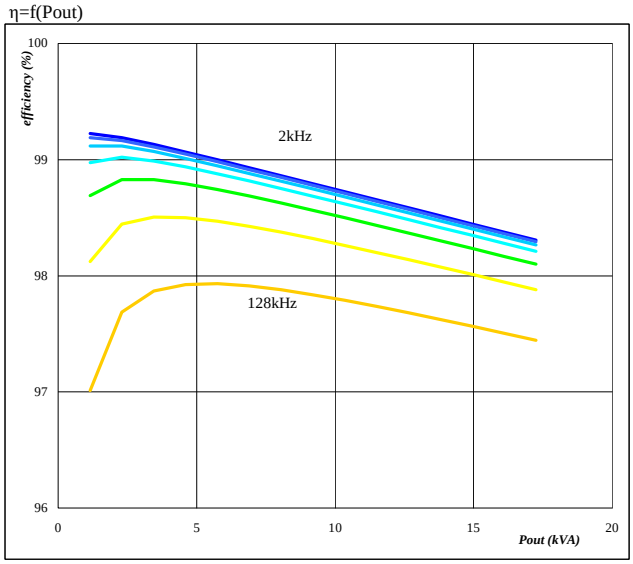


Conditions: T_j= 125 °C
f_{sw}= 20 kHz
DC link= 700 V
parameter: phase displacement
φ from 0 ° to 180 °
in steps of 30 °

Figure 28. per MODULE

Typical efficiency as a function of output power

η=f(Pout)

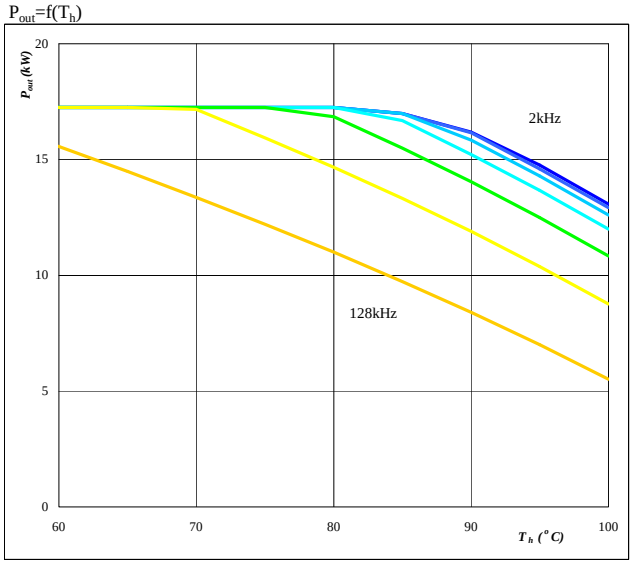


Conditions: T_j= 125 °C φ= 0 °
DC link= 700 V
parameter: Switching freq.
fsw from 2 kHz to 128 kHz
in steps of factor 2

Figure 29. per MODULE

Typical available output power as a function of heat sink temperature

$P_{out}=f(T_h)$

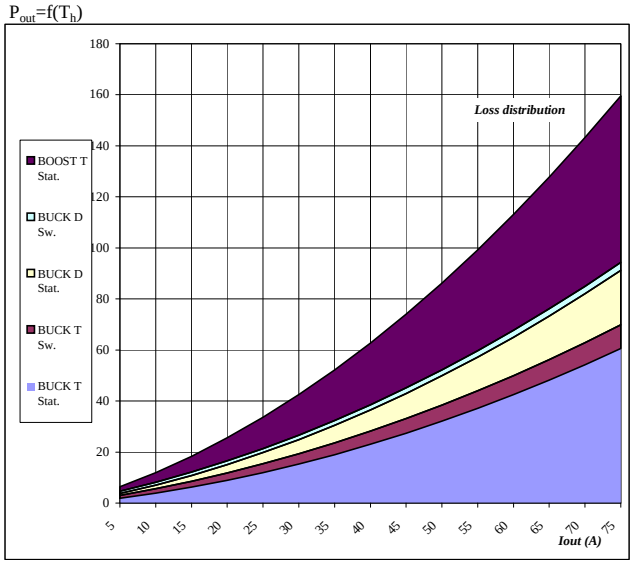


Conditions: T_j= Tjmax-25 °C
DC link= 700 V
φ= 0 °
parameter: Switching freq.
fsw from 2 kHz to 128 kHz
in steps of factor 2

Figure 30. per MODULE

Typical loss distribution as a function of output current

$P_{out}=f(T_h)$

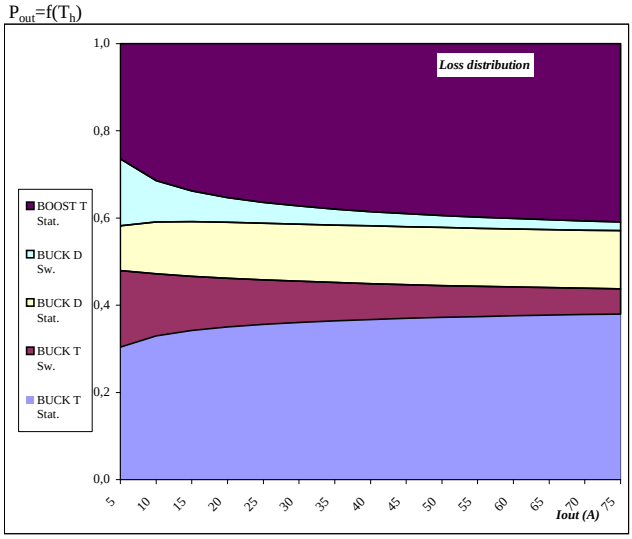


Conditions: T_j= 125 °C
f_{sw}= 20 kHz
DC link= 700 V
φ= 0 °

Figure 31. per MODULE

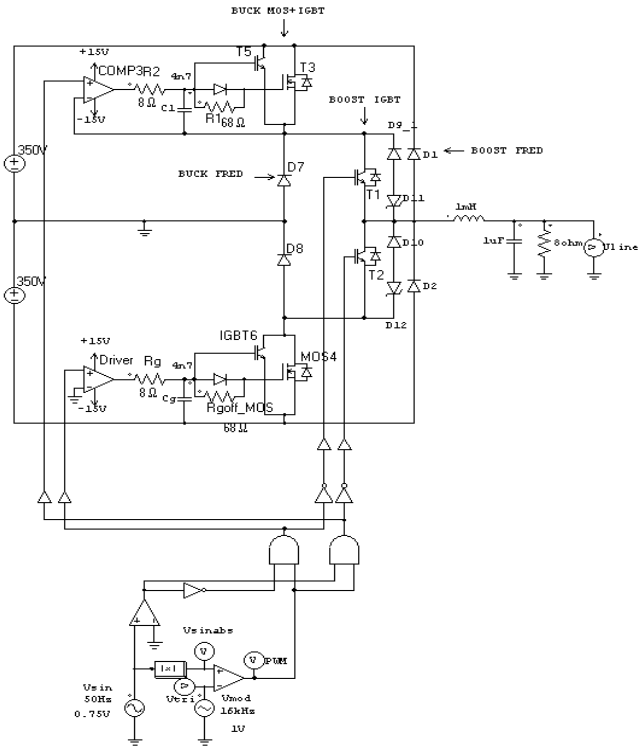
Typical relativ loss distribution as a function of output current

$P_{out}=f(T_h)$



Conditions:			
	T_j=	125	°C
	f_{sw}=	20	kHz
	DC link=	700	V
	φ=	0 °	

Figure 32. per MODULE



Cg is included in the module