flow MNPC 1 — mixed voltage NPC Application — 1200 V / 160 A

General conditions

half bridge IGBT		
V_{GEon}	=	15 V
V_{GEoff}	=	-15 V
R_{gon}	=	4
R_{goff}	=	4

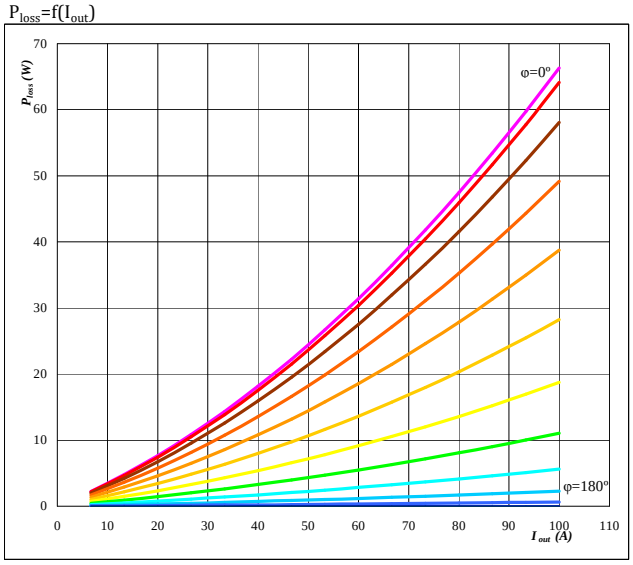
V_{out}= 230 VAC

neutral point IGBT		
V_{GEon}	=	15 V
V_{GEoff}	=	-15 V
R_{gon}	=	4
R_{goff}	=	4

Figure 1. half bridge IGBT

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

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

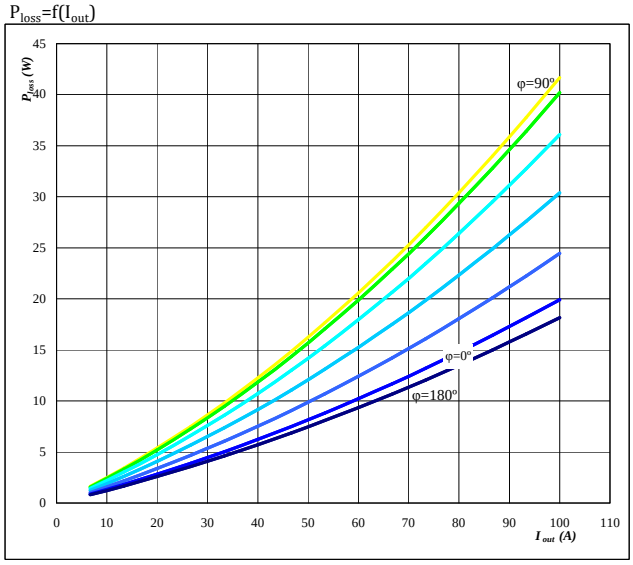


Conditions T_j= 150 °C
parameter **φ** from 0° to 180°
in 12 steps

Figure 2. neutral point FWD

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

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

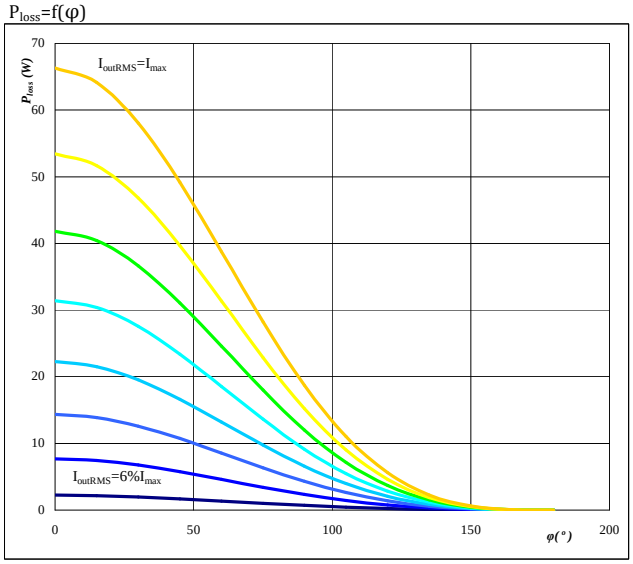


Conditions T_j= 125 °C
parameter **φ** from 0° to 180°
in 12 steps

Figure 3. half bridge IGBT

Typical average static loss as a function of phase displacement φ

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

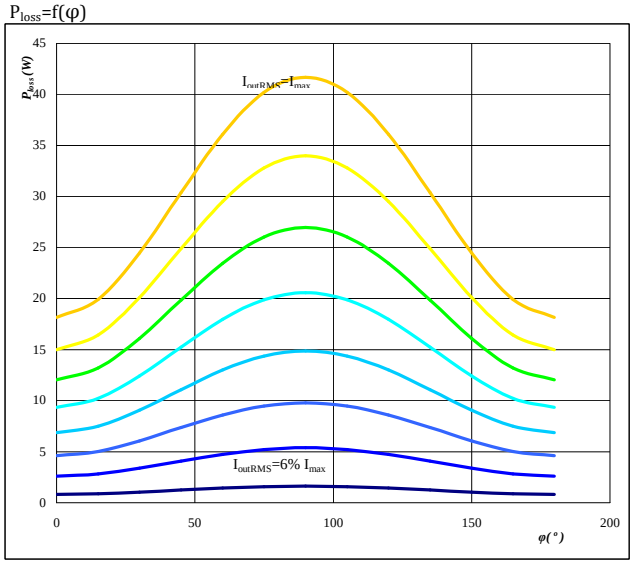


Conditions T_j= 150 °C
parameter I_{oRMS} from 6,67 A to 100 A
in steps of 13 A

Figure 4. neutral point FWD

Typical average static loss as a function of phase displacement φ

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

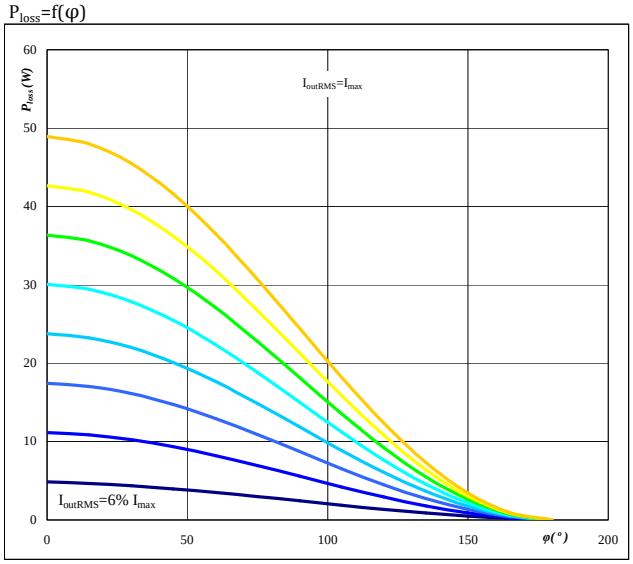


Conditions T_j= 125 °C
parameter I_{oRMS} from 6,67 A to 100 A
in steps of 13 A

Figure 5. **half bridge IGBT**

Typical average switching loss as a function of phase displacement φ

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

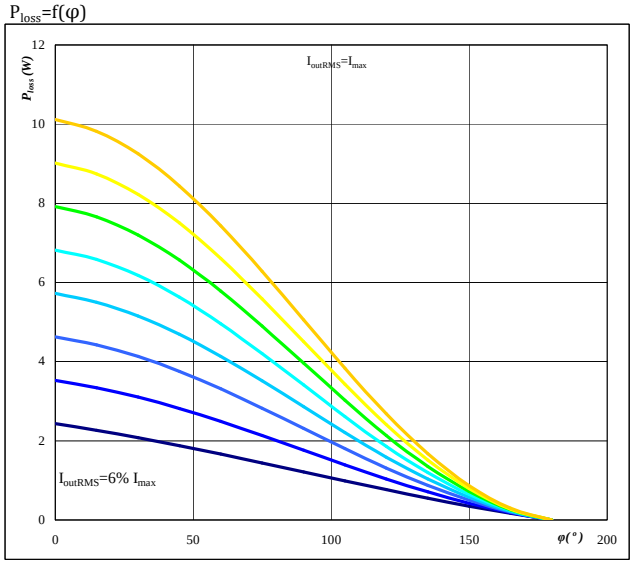


Conditions	T_j=	150	°C	
	f_{sw}=	16	kHz	
	DC link=	700	V	
parameter	I_{oRMS}	from 6,67 A	to	100 A
	in steps of	13	A	

Figure 6. **neutral point FWD**

Typical average switching loss as a function of phase displacement φ

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

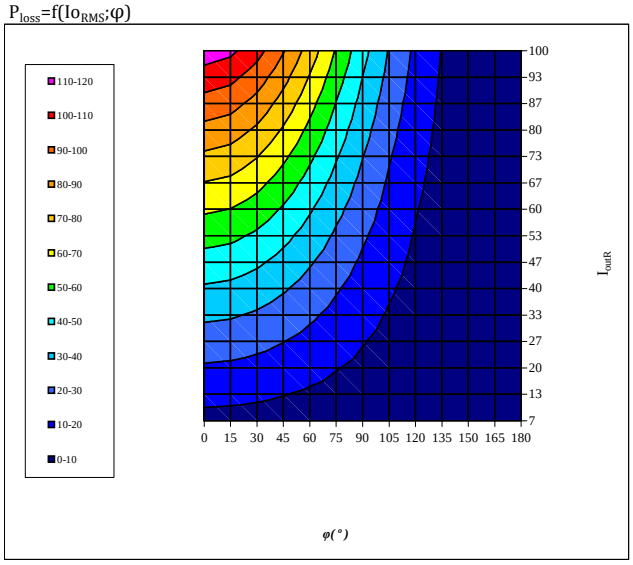


Conditions	T_j=	125	°C	
	f_{sw}=	16	kHz	
	DC link=	700	V	
parameter	I_{oRMS}	from 6,67 A	to	100 A
	in steps of	13	A	

Figure 7. **half bridge IGBT**

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

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

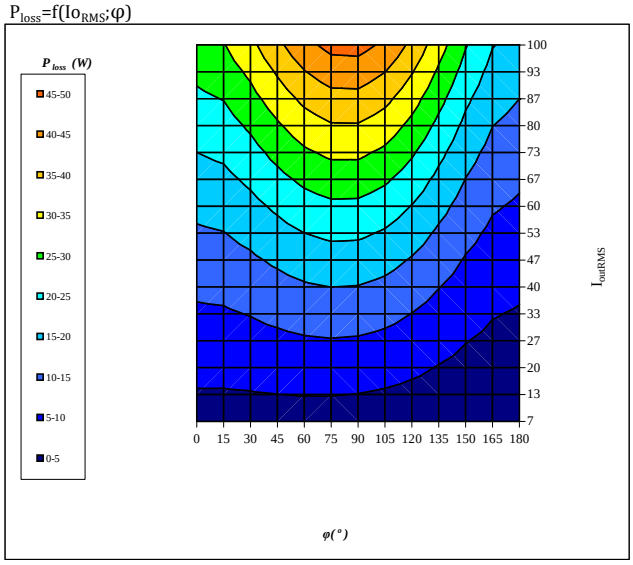


Conditions	T_j=	150	°C
	DC link=	700	V
	f_{sw}=	16	kHz

Figure 8. **neutral point FWD**

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

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

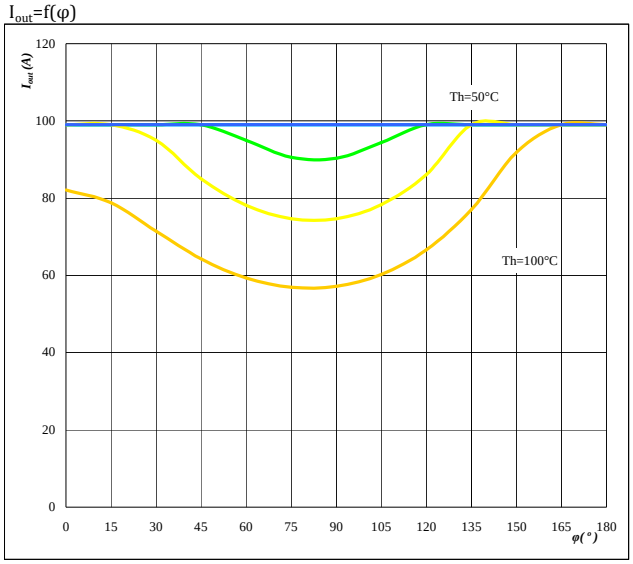


Conditions	T_j=	125	°C
	DC link=	700	V
	f_{sw}=	16	kHz

Figure 9. for half bridge IGBT + neutral point FWD

Typical available output current as a function of phase displacement φ

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

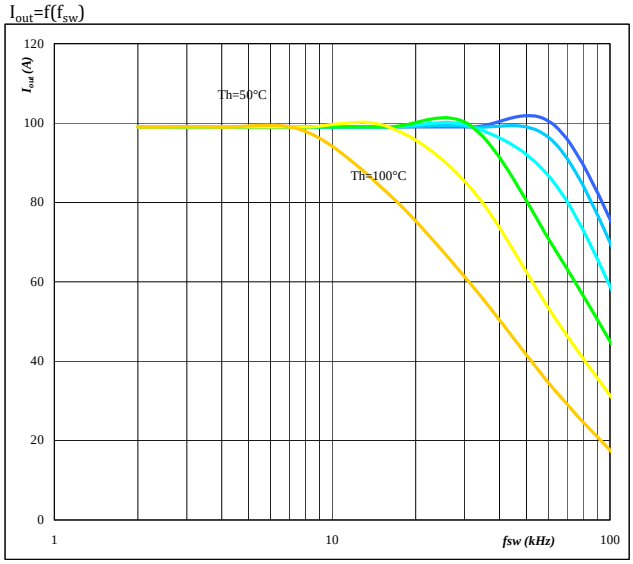


Conditions T_j= 150/125 °C f_{sw}= 16 kHz
DC link= 700 V
parameter: Heatsink temp.
T_h from 50 °C to 100 °C
in 10 °C steps

Figure 10. for half bridge IGBT + neutral point FWD

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

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

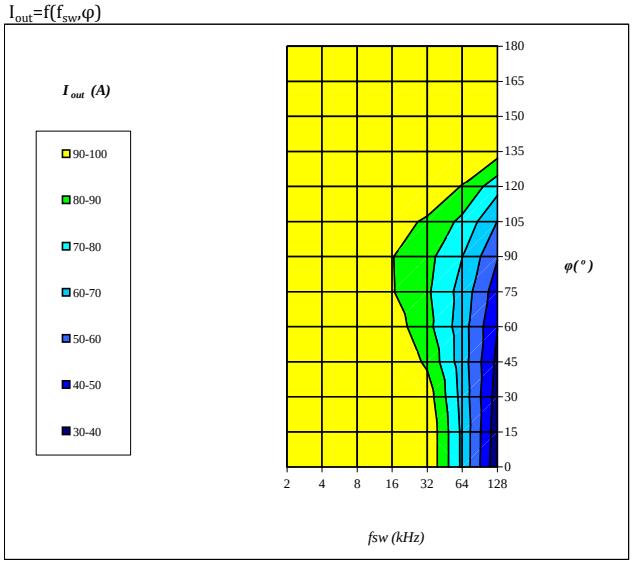


Conditions T_j= 150/125 °C φ= 0 °
DC link= 700 V
parameter Heatsink temp.
T_h from 50 °C to 100 °C
in 10 °C steps

Figure 11. for half bridge IGBT + neutral point FWD

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

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

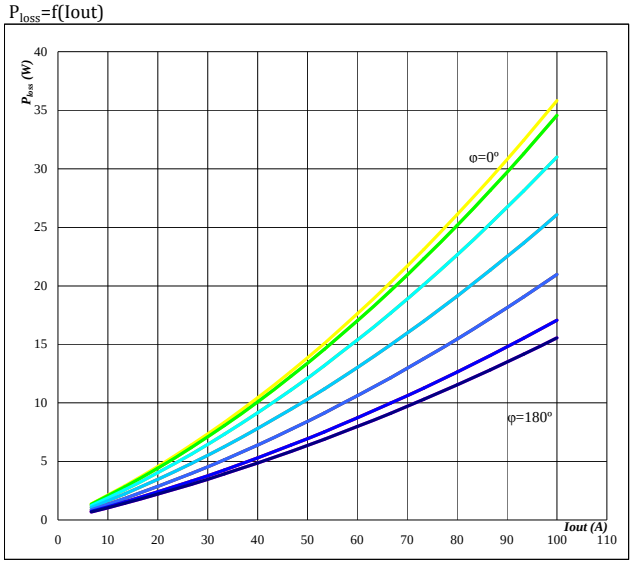


Conditions T_j= 150/125 °C
DC link= 700 V
T_h= 80 °C

Figure 12. **neutral point IGBT**

Typical average static loss as a function of output current

$P_{loss}=f(Iout)$

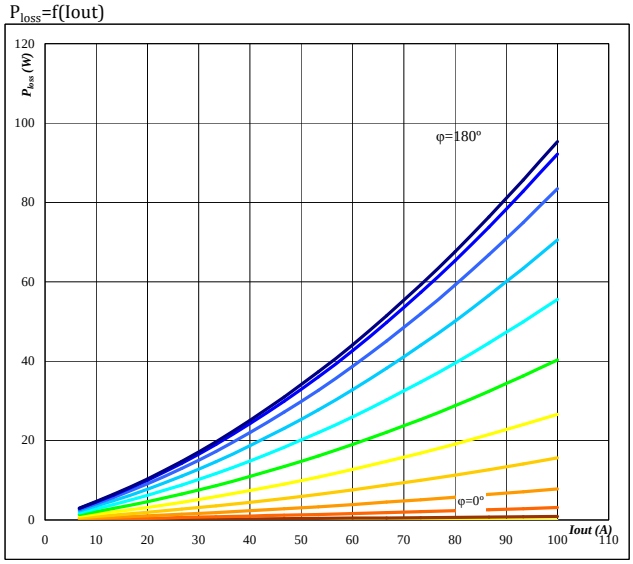


Conditions T_j= 150 °C
parameter **φ** from 0° to 180°
in 12 steps

Figure 13. **half bridge FWD**

Typical average static loss as a function of output current

$P_{loss}=f(Iout)$

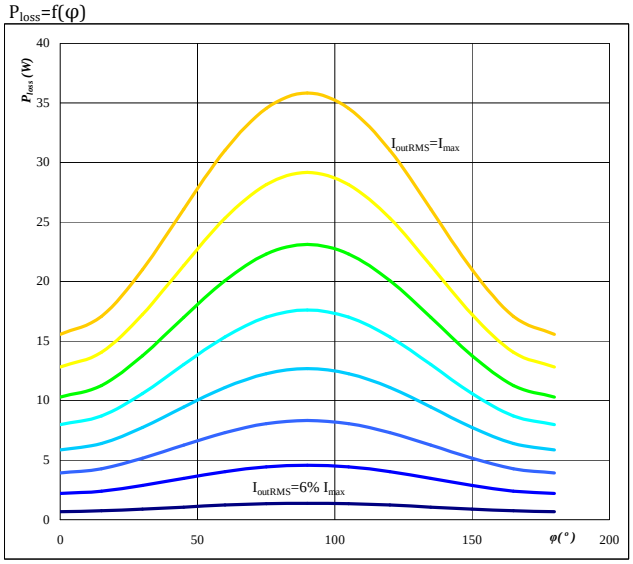


Conditions T_j= 125 °C
parameter **φ** from 0° to 180°
in 12 steps

Figure 14. **neutral point IGBT**

Typical average static loss as a function of phase displacement

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

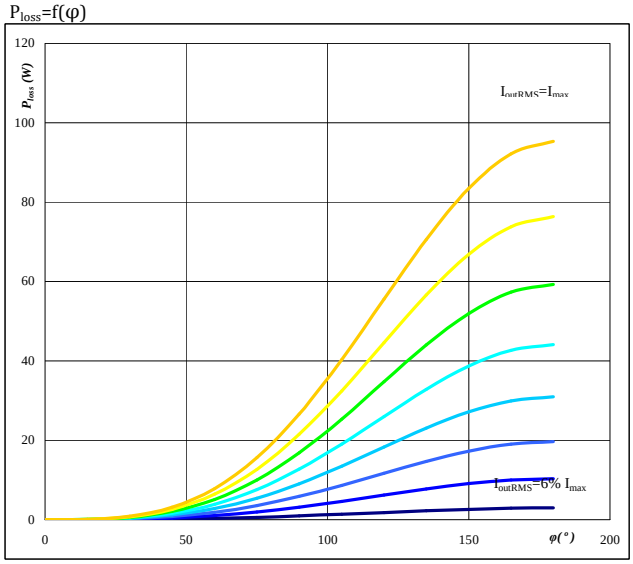


Conditions T_j= 150 °C
parameter I_{oRMS} from 7 A to 100 A
in steps of 13 A

Figure 15. **half bridge FWD**

Typical average static loss as a function of phase displacement

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

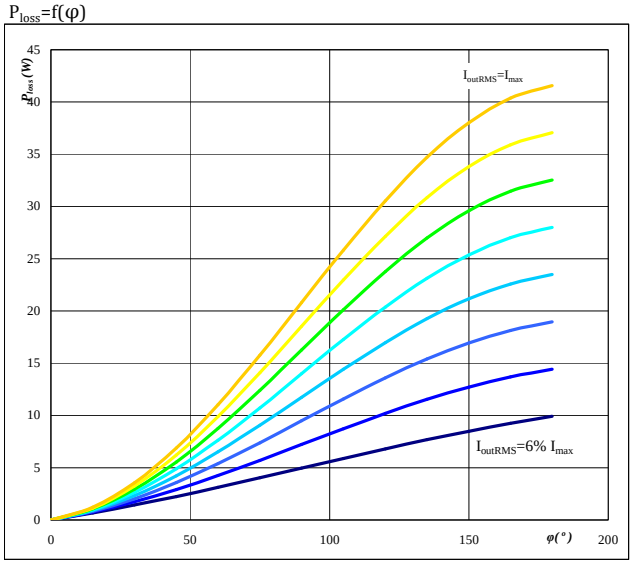


Conditions T_j= 125 °C
parameter I_{oRMS} from 7 A to 100 A
in steps of 13 A

Figure 16. **neutral point IGBT**

Typical average switching loss as a function of phase displacement

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

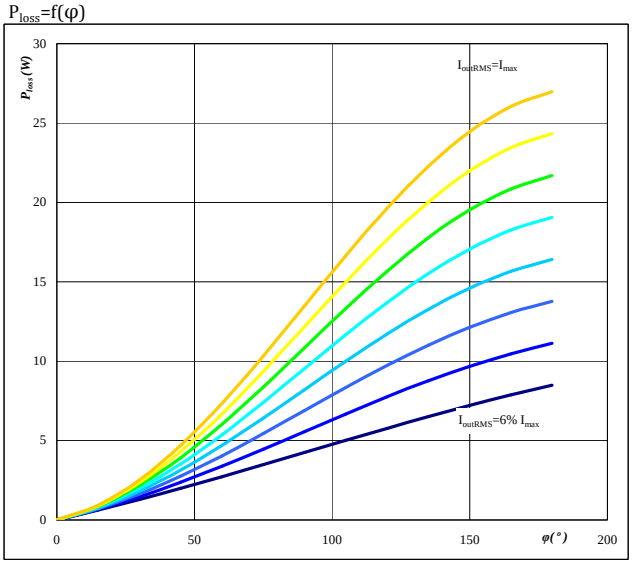


Conditions	T_j=	150	°C	f_{sw}=	16	kHz
	DC link=	700	V			
parameter	I_{oRMS}	from	7 A	to	100 A	
		in steps of	13 A		A	

Figure 17. **half bridge FWD**

Typical average switching loss as a function of phase displacement

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

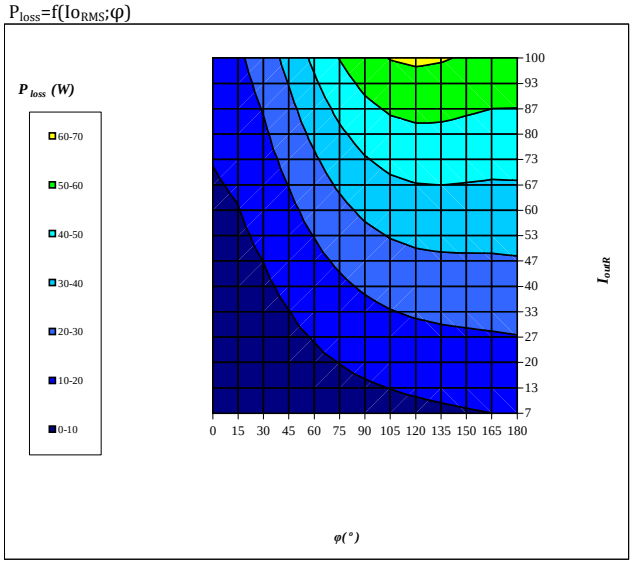


Conditions	T_j=	125	°C	f_{sw}=	16	kHz
	DC link=	700	V			
parameter	I_{oRMS}	from	7 A	to	100 A	
		in steps of	13 A		A	

Figure 18. **neutral point IGBT**

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

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

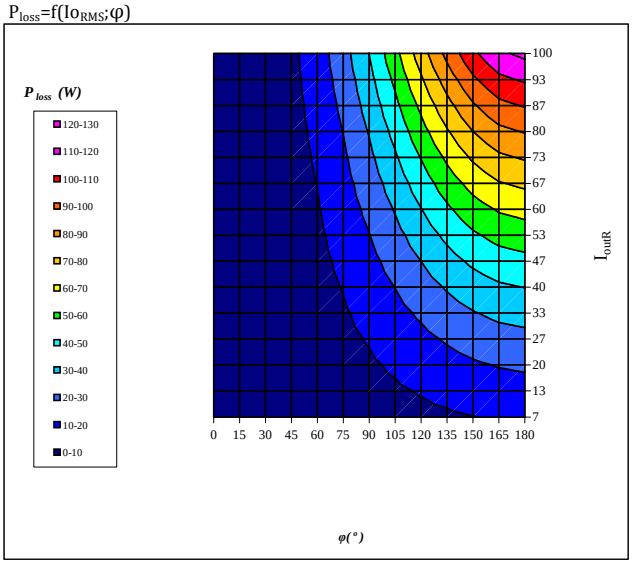


Conditions	T_j=	150	°C
	DC link=	700	V
	f_{sw}=	16	kHz

Figure 19. **half bridge FWD**

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

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

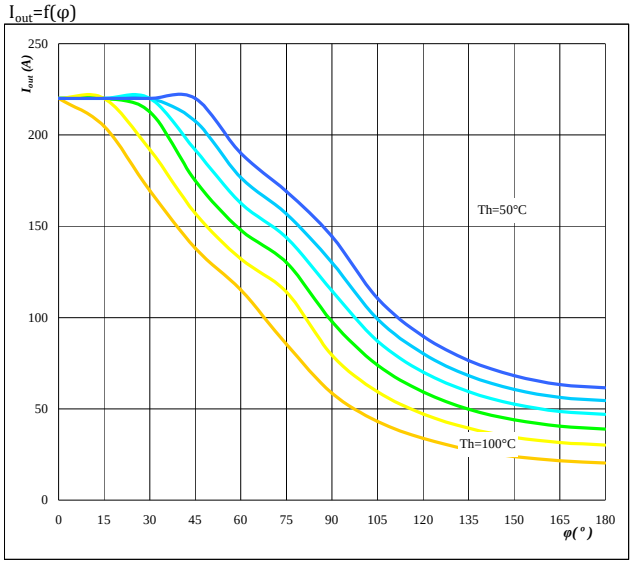


Conditions	T_j=	125	°C
	DC link=	700	V
	f_{sw}=	16	kHz

Figure 20. **for neutral point IGBT + half bridge FWD**

Typical available output current as a function of of phase displacement

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

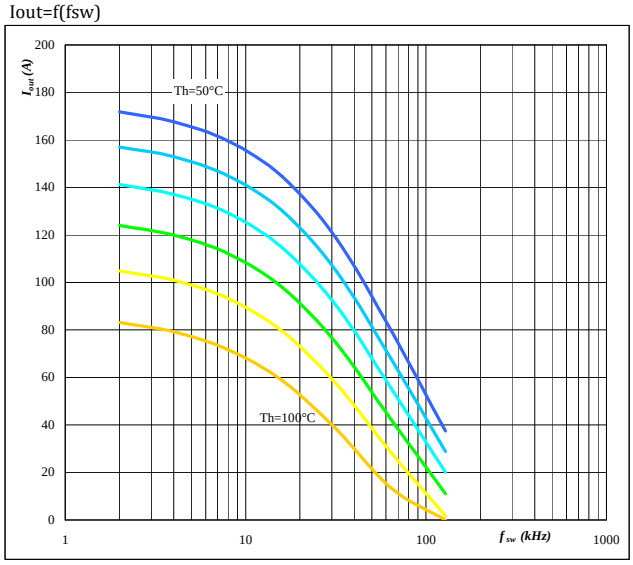


Conditions	T_j=	150/125	°C	f_{sw}=	16 kHz
	DC link=	700	V		
parameter:		Heatsink temp.			
	T_h from	50	°C to	100	°C
	in	10	°C	steps	

Figure 21. **for neutral point IGBT + half bridge FWD**

Typical available output current as a function of switching frequency

Iout=f(fsw)

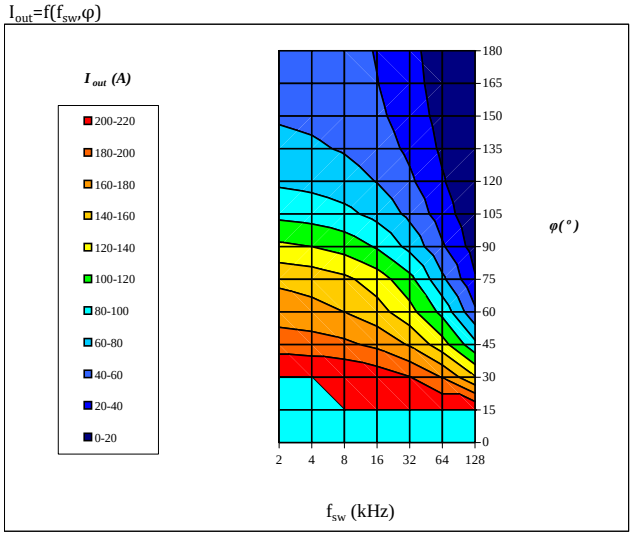


Conditions	T_j=	150/125	°C	φ=	90°
	DC link=	700	V		
parameter:		Heatsink temp.			
	T_h from	50	°C to	100	°C
	in	10	°C	steps	

Figure 22. **for neutral point IGBT + half bridge FWD**

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

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

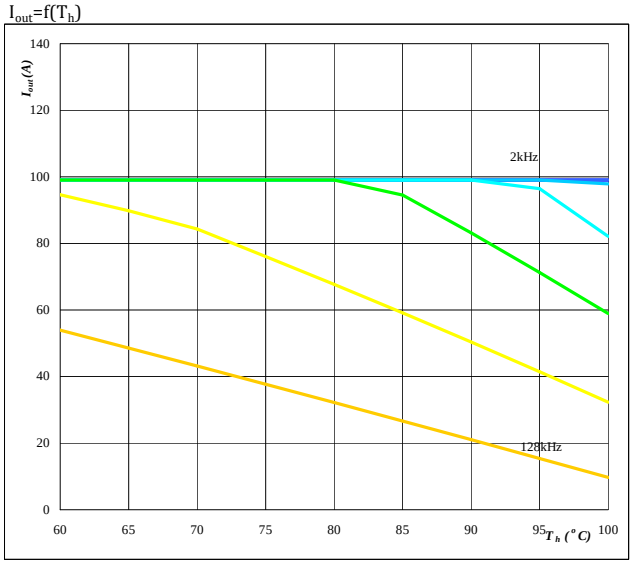


Conditions	T_j=	150/125	°C
	DC link=	700	V
	T_h=	80	°C

Figure 23. **per PHASE**

Typical available output current as a function of heat sink temperature

$I_{out}=f(T_h)$

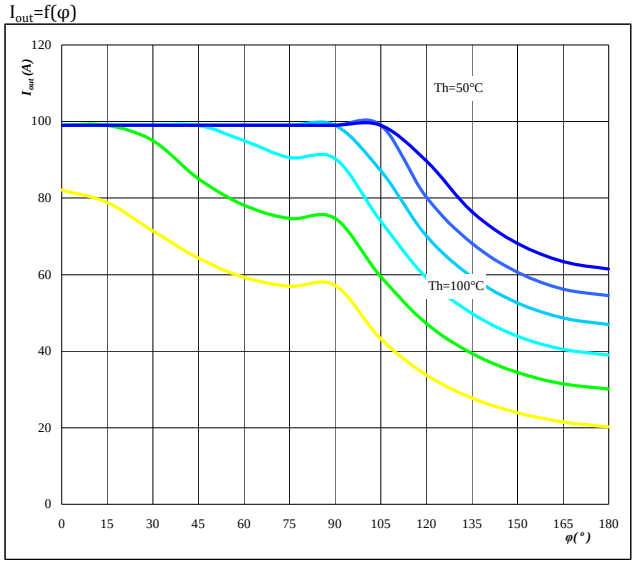


Conditions	T_j=	150/125	°C		
	DC link=	700	V		
	φ=	0	°		
parameter:	Switching freq.				
	f_{sw} from	2	kHz to	128	kHz
	in steps of factor 2				

Figure 24. **per PHASE**

Typical available output current as a function of phase displacement

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

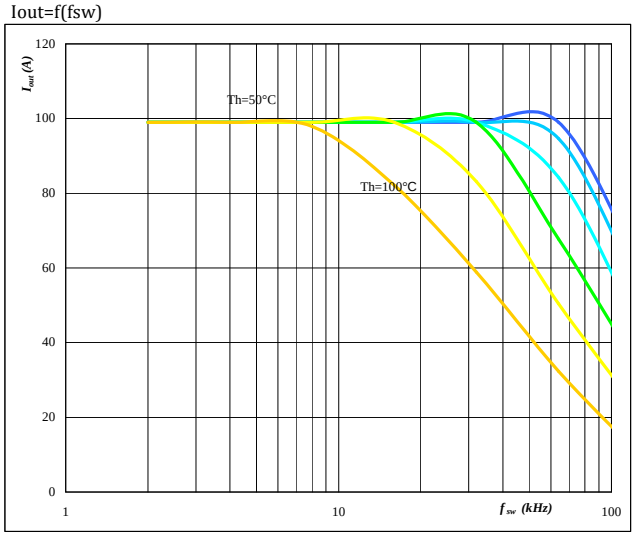


Conditions	T_j=	150/125	°C		
	DC link=	700	V		
	f_{sw}=	16	kHz		
parameter:	Heatsink temp.				
	T_h from	50	°C to	100	
	in	10	°C	steps	

Figure 25. **per PHASE**

Typical available output current as a function of switching frequency

Iout=f(fsw)

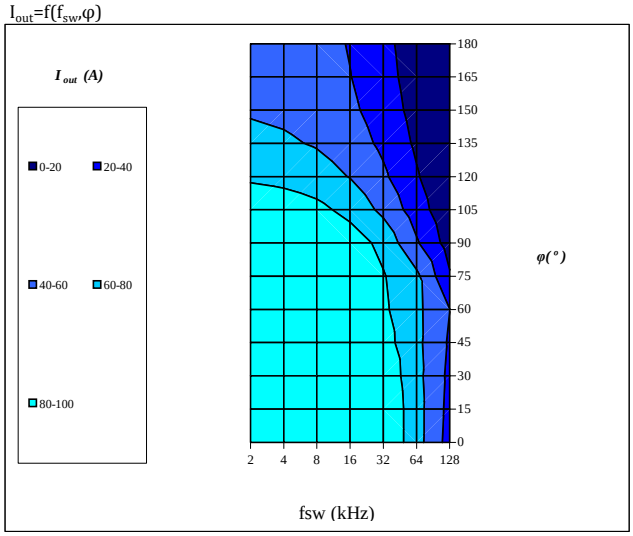


Conditions	T_j=	150/125	°C		φ=	0	°
	DC link=	700	V				
parameter:	Heatsink temp.						
	T_h from	50	°C to	100			
	in	10	°C	steps			

Figure 26. **per PHASE**

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

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

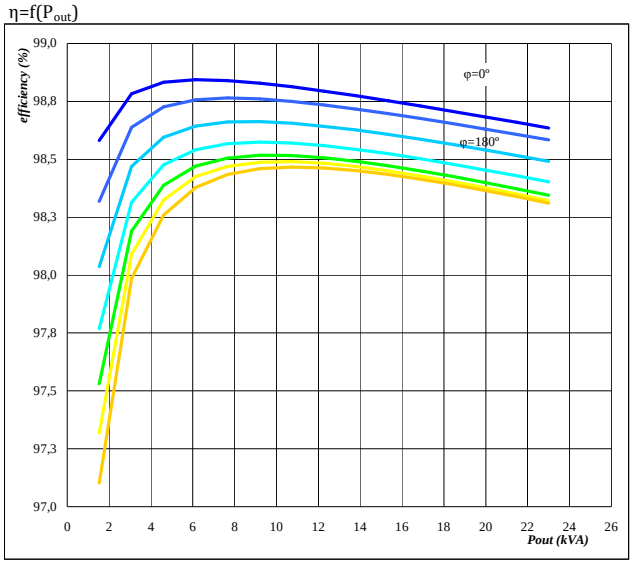


Conditions	T_j=	150/125	°C
	DC link=	700	V
	T_h=	80	°C

Figure 27. **per PHASE**

Typical efficiency as a function of output power

$\eta=f(P_{out})$

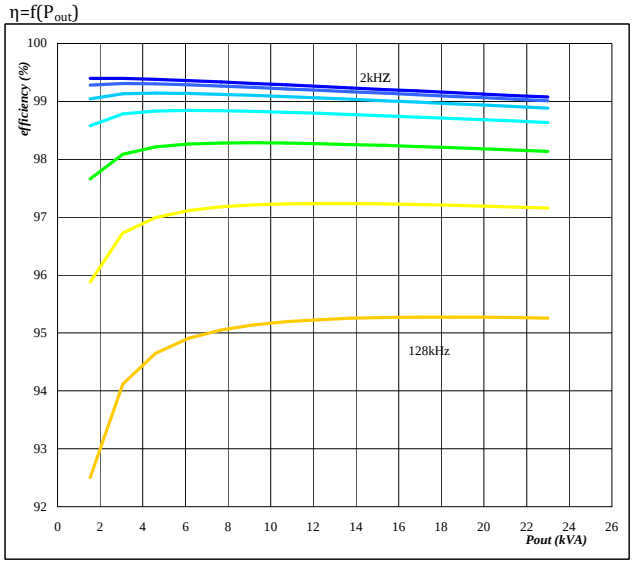


Conditions T_j= 150/125 °C
f_{sw}= 16 kHz
DC link= 700 V
parameter: phase displacement
φ from 0 ° to 180 °
in steps of 30 °

Figure 28. **per PHASE**

Typical efficiency as a function of output power

$\eta=f(P_{out})$

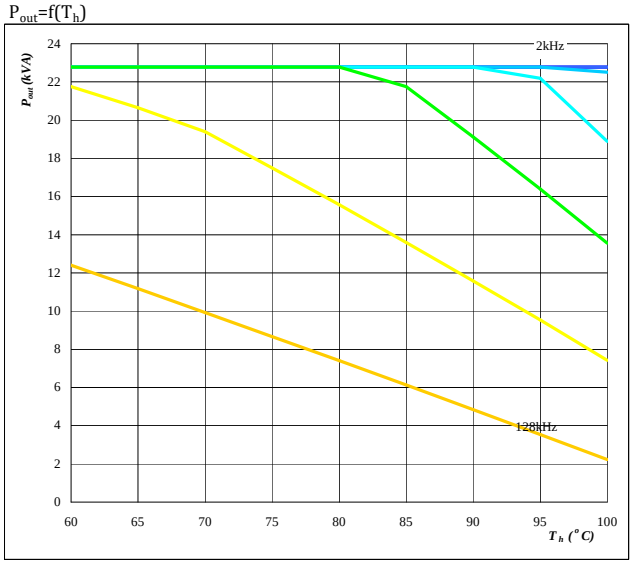


Conditions T_j= 150/125 °C φ= 0 °
DC link= 700 V
parameter: Switching freq.
f_{sw} from 2 kHz to 128 kHz
in steps of factor 2

Figure 29. **per PHASE**

Typical available output power as a function of heat sink temperature

$P_{out}=f(T_h)$

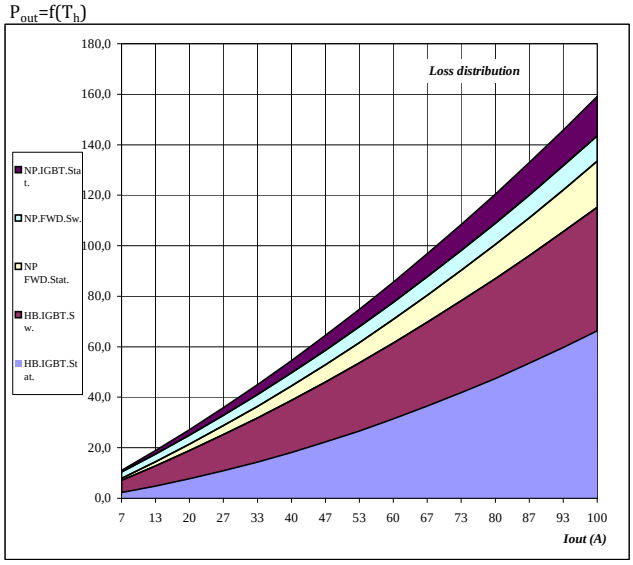


Conditions T_j= 150/125 °C
DC link= 700 V
φ= 0 °
parameter: Switching freq.
f_{sw} from 2 kHz to 128 kHz
in steps of factor 2

Figure 30. **per PHASE**

Typical loss distribution as a function of output current

$P_{out}=f(T_h)$

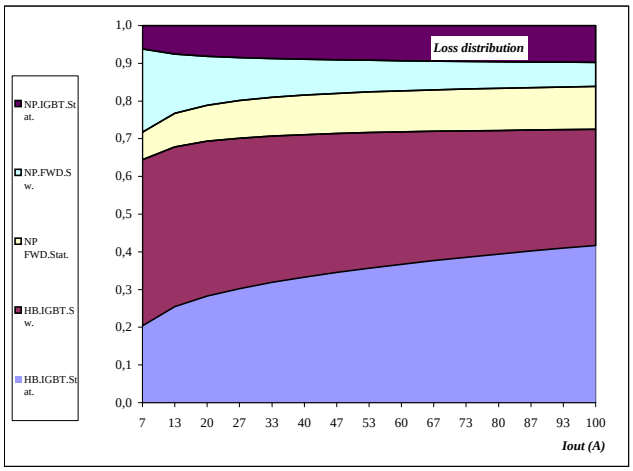


Conditions T_j= 150/125 °C
f_{sw}= 16 kHz
DC link= 700 V
φ= 0 °

Figure 31. **per PHASE**

Typical relativ loss distribution as a function of output current

$P_{out}=f(T_h)$



Conditions

T_j=	150/125	°C
f_{sw}=	16	kHz
DC link=	700	V
φ=	0 °	

Figure 32.

Schematic