flowMNPC 1 — mixed voltage NPC Application — 1200V/160A

General conditions

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

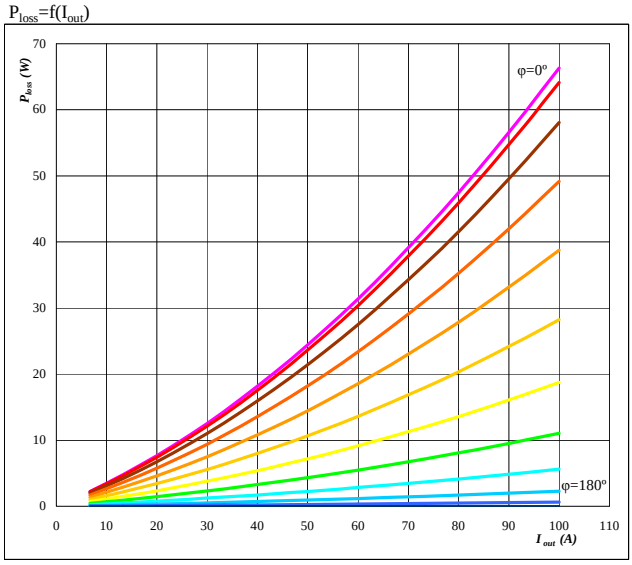
Vout= 230 VAC

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}

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

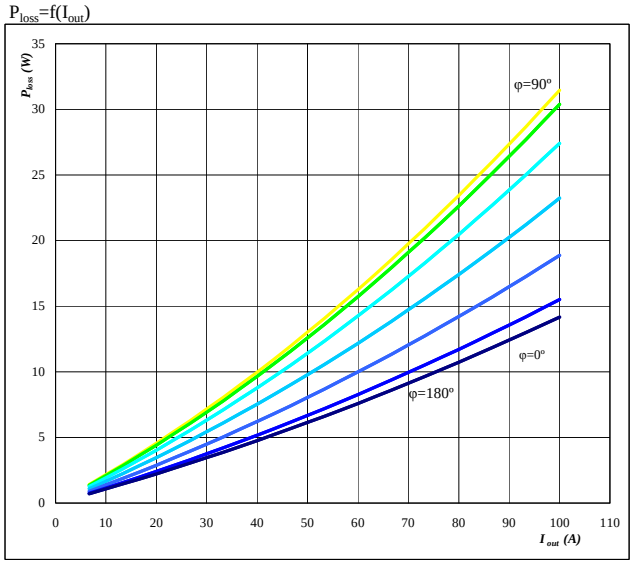


Conditions: T_j= 150 °C
parameter: **φ** from 0° to 180°
in 12 steps

Figure 2. neutral point FWD

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

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

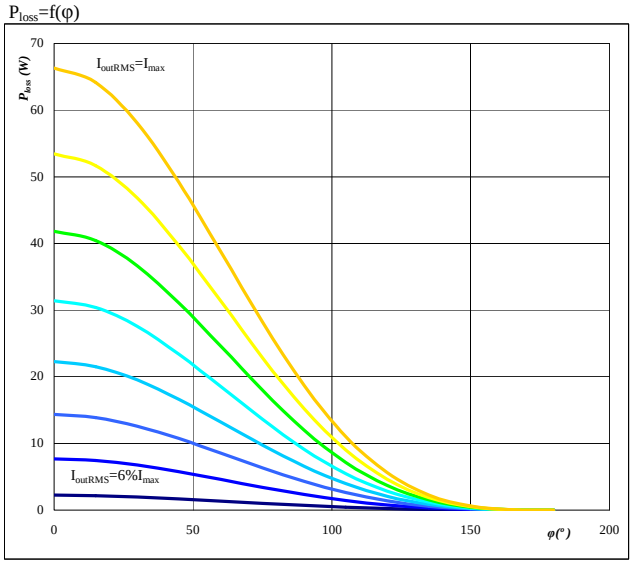


Conditions: T_j= 125 °C
parameter: **φ** from 0° to 180°
in 12 steps

Figure 3. half bridge IGBT

Typical average static loss as a function of phase displacement φ

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

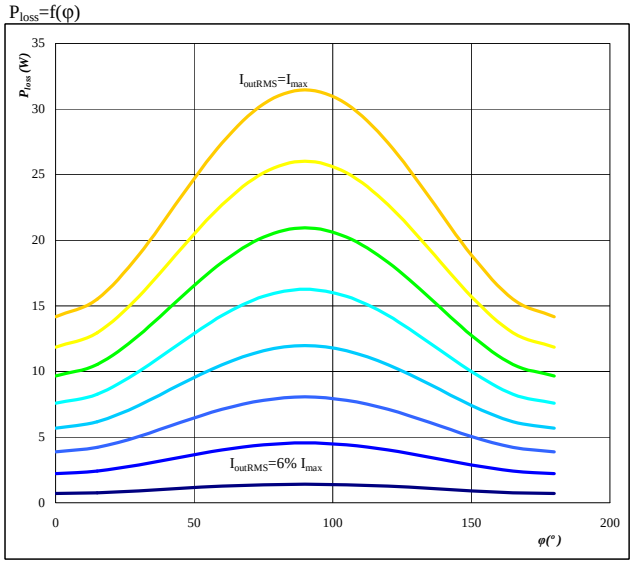


Conditions: T_j= 150 °C
parameter: I_{oRMS} from 6,67 A to 100 A
in steps of 13 A

Figure 4. neutral point FWD

Typical average static loss as a function of phase displacement φ

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

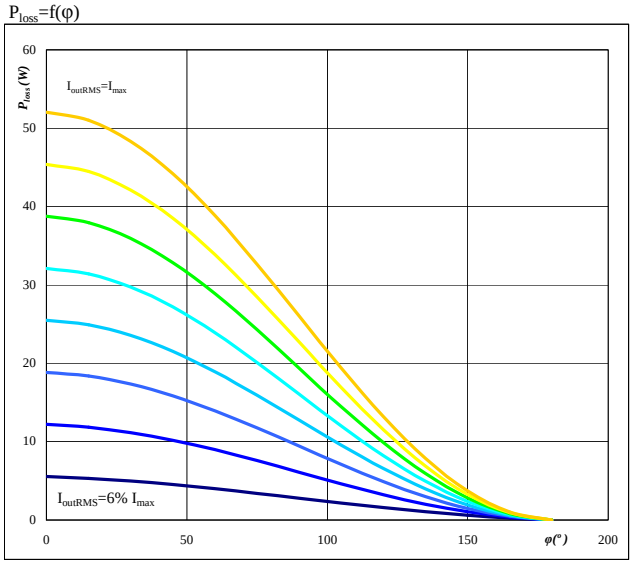


Conditions: T_j= 125 °C
parameter: I_{oRMS} from 6,67 A to 100 A
in steps of 13 A

Figure 5. half bridge IGBT

Typical average switching loss as a function of phase displacement φ

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

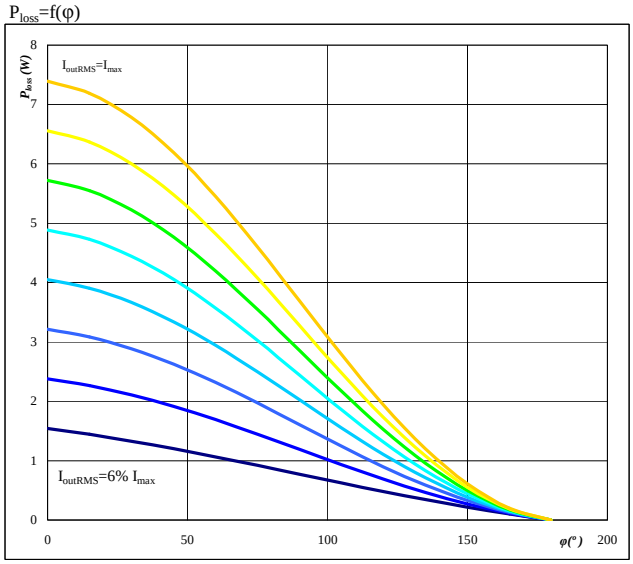


Conditions: T_j= 150 °C; f_{sw}= 16 kHz; DC link= 700 V
parameter: I_{oRMS} from 6,67 A to 100 A in steps of 13 A

Figure 6. neutral point FWD

Typical average switching loss as a function of phase displacement φ

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

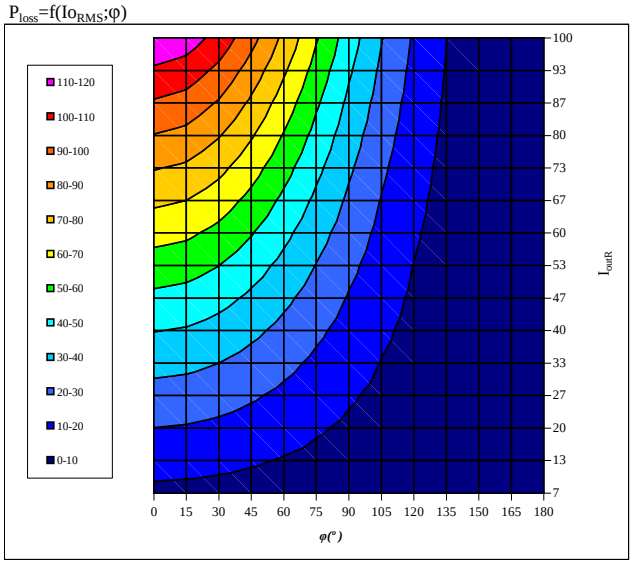


Conditions: T_j= 125 °C; f_{sw}= 16 kHz; DC link= 700 V
parameter: I_{oRMS} from 6,67 A to 100 A in steps of 13 A

Figure 7. half bridge IGBT

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

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

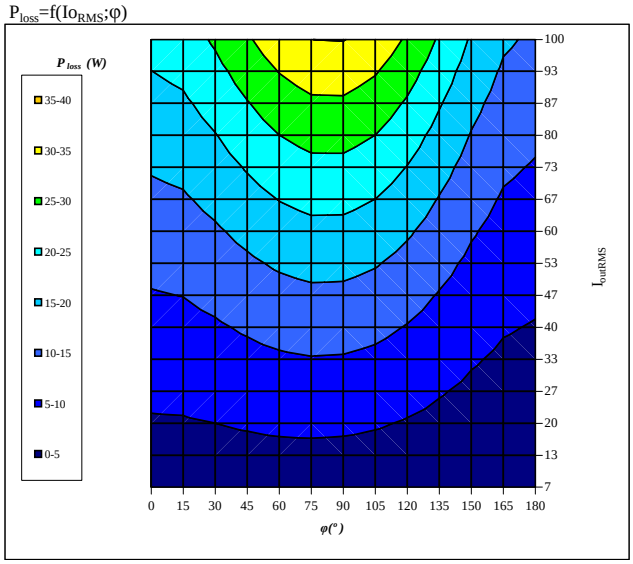


Conditions: T_j= 150 °C; DC link= 700 V; f_{sw}= 16 kHz

Figure 8. neutral point FWD

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

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

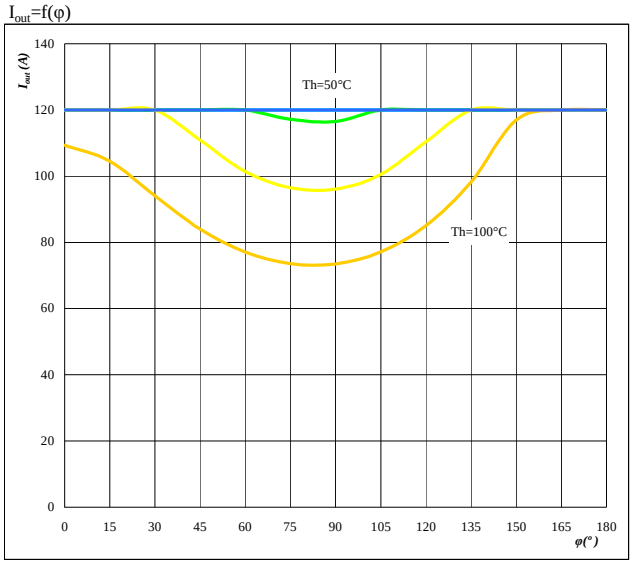


Conditions: T_j= 125 °C; DC link= 700 V; f_{sw}= 16 kHz

Figure 9. for half bridge IGBT + neutral point FWD

Typical available output current as a function of phase displacement φ

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

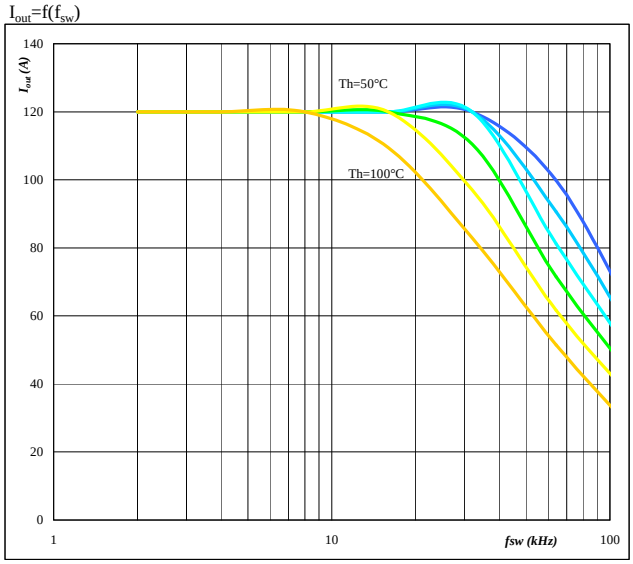


Conditions:	T_j=	150/125	°C		f_{sw}=	16 kHz
	DC link=	700	V			
parameter:	Heatsink temp.					
	T_h from	50	°C to	100	°C	
	in	10	°C	steps		

Figure 10. for half bridge IGBT + neutral point FWD

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

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

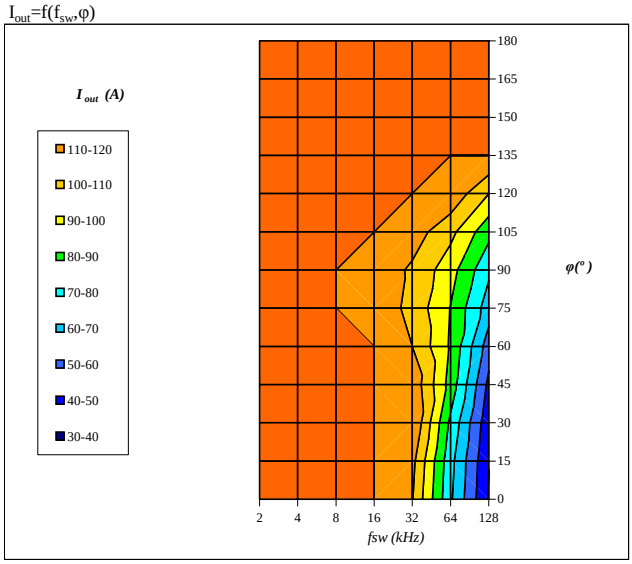


Conditions:	T_j=	150/125	°C		φ=	0 °
	DC link=	700	V			
parameter:	Heatsink temp.					
	T_h from	50	°C to	100	°C	
	in	10	°C	steps		

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

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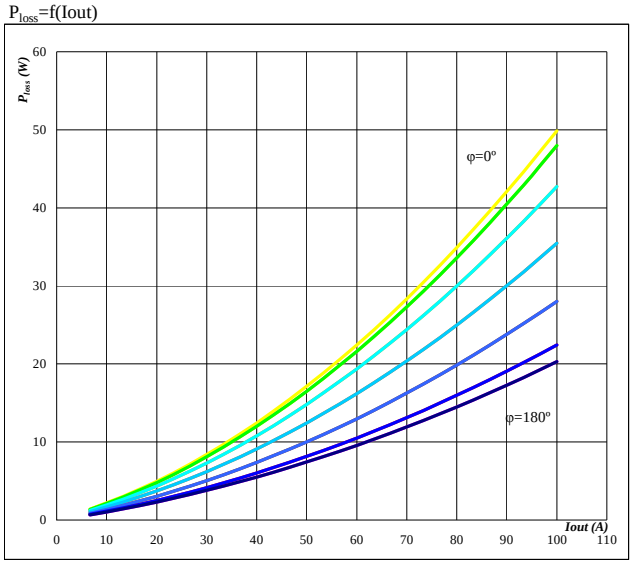
Figure 12. neutral point IGBT

Typical average static loss as a function of output current

$P_{loss}=f(Iout)$

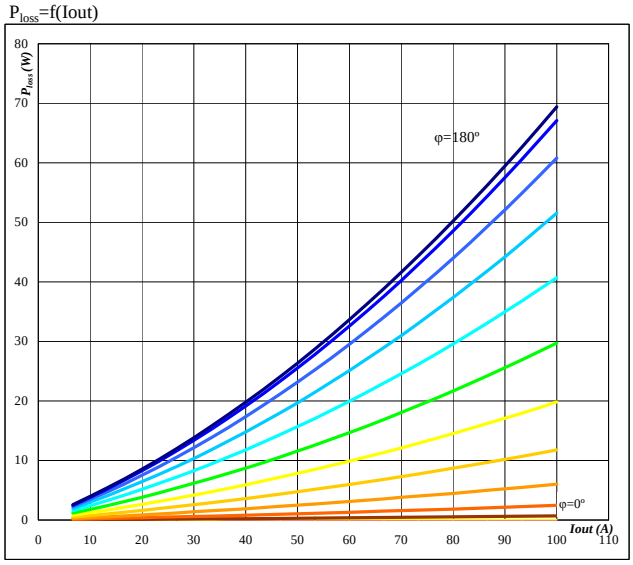


Conditions: T_j= 150 °C
parameter: φ from 0° to 180°
in 12 steps

Figure 13. half bridge FWD

Typical average static loss as a function of output current

$P_{loss}=f(Iout)$

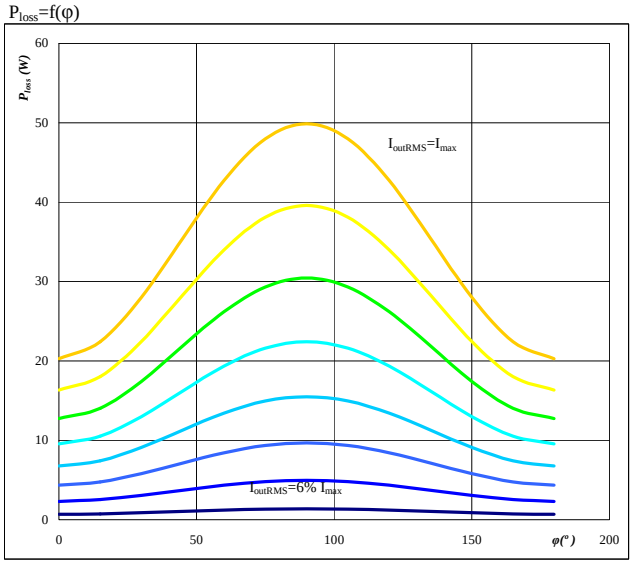


Conditions: T_j= 125 °C
parameter: φ from 0° to 180°
in 12 steps

Figure 14. neutral point IGBT

Typical average static loss as a function of phase displacement

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

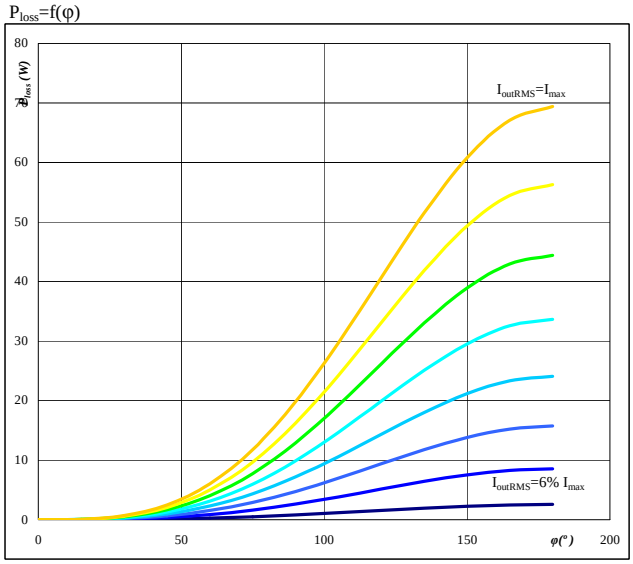


Conditions: T_j= 150 °C
parameter: I_{oRMS} from 7 A to 100 A
in steps of 13 A

Figure 15. half bridge FWD

Typical average static loss as a function of phase displacement

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

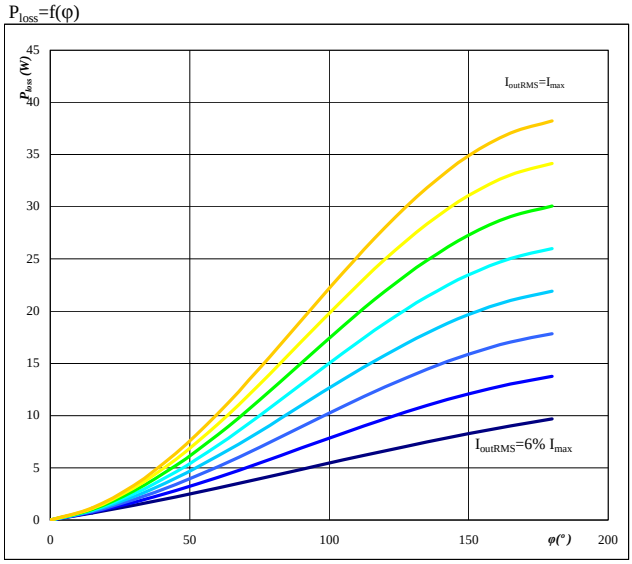


Conditions: T_j= 125 °C
parameter: I_{oRMS} from 7 A to 100 A
in steps of 13 A

Figure 16. neutral point IGBT

Typical average switching loss as a function of phase displacement

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

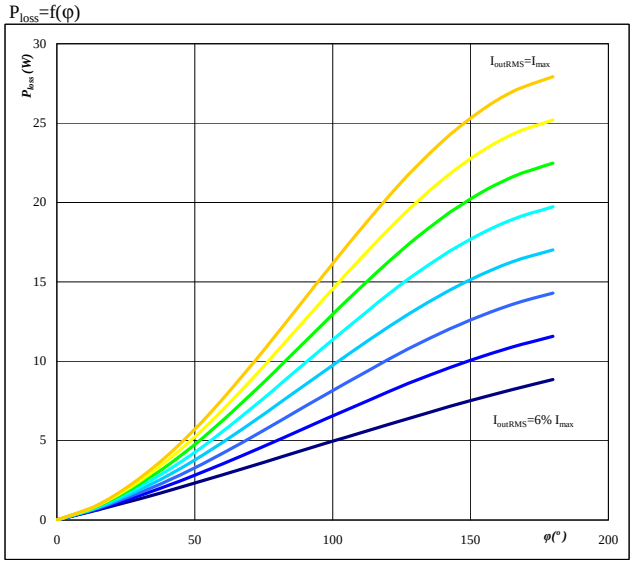


Conditions:	T_j=	150	°C	f_{sw}=	16	kHz
	DC link=	700	V			
parameter:	I_{oRMS}	from	7 A	to	100 A	
		in steps of	13 A	A		

Figure 17. half bridge FWD

Typical average switching loss as a function of phase displacement

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

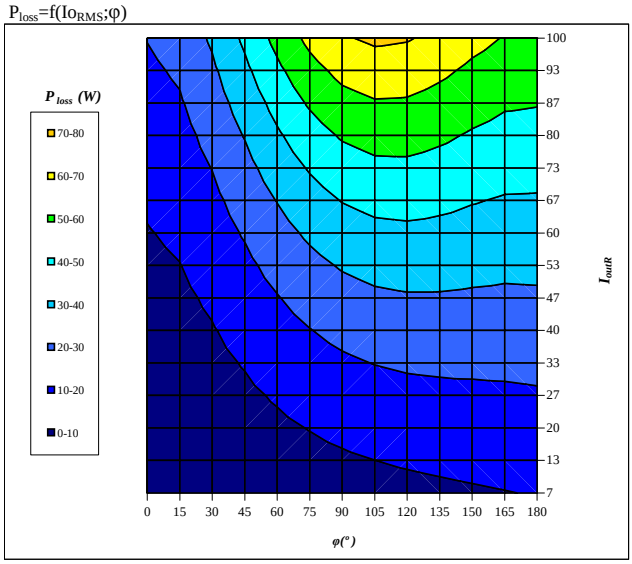


Conditions:	T_j=	125	°C	f_{sw}=	16	kHz
	DC link=	700	V			
parameter:	I_{oRMS}	from	7 A	to	100 A	
		in steps of	13 A	A		

Figure 18. neutral point IGBT

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

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

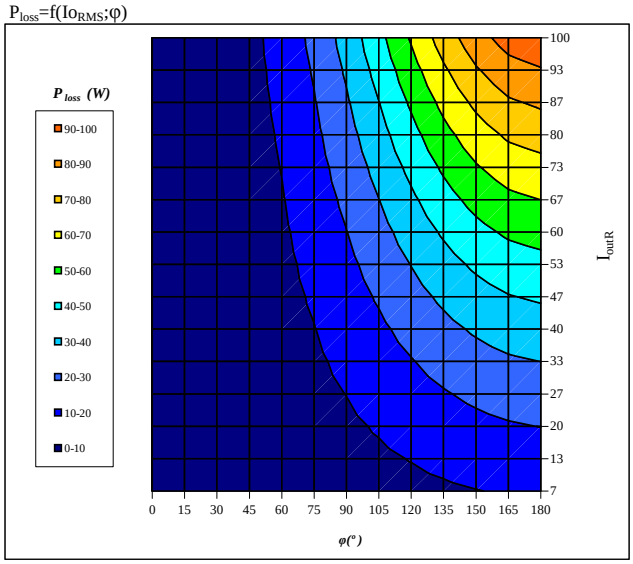


Conditions:	T_j=	150	°C
	DC link=	700	V
	f_{sw}=	16	kHz

Figure 19. half bridge FWD

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

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

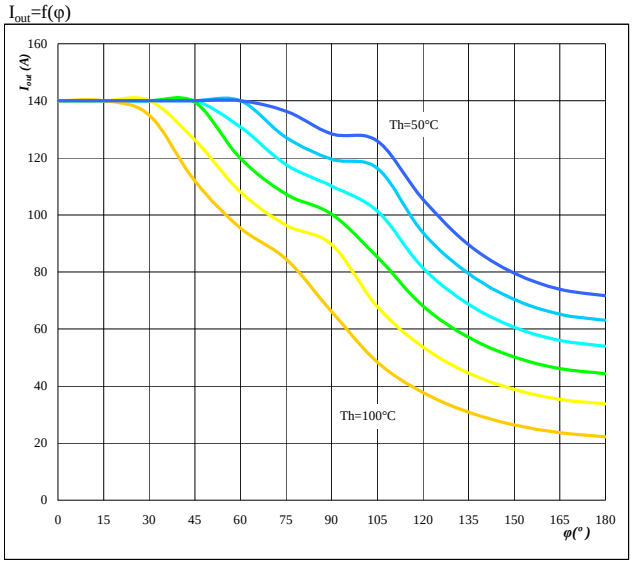


Conditions:	T_j=	125	°C
	DC link=	700	V
	f_{sw}=	16	kHz

Figure 20. for neutral point IGBT + half bridge FWD

Typical available output current as a function of of phase displacement

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

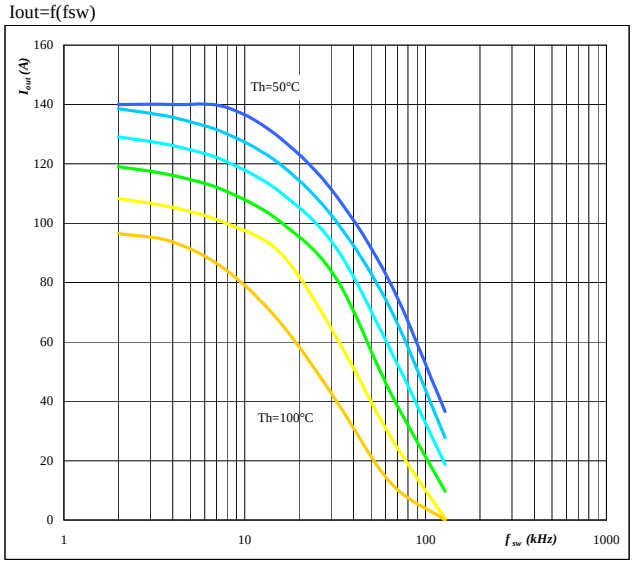


Conditions:	T_j=	150/125	°C	f_{sw}=	16 kHz
	DC link=	700	V		
parameter:	Heatsink temp.				
	Th from	50	°C to	100	°C
	in	10	°C	steps	

Figure 21. for neutral point IGBT + half bridge FWD

Typical available output current as a function of switching frequency

Iout=f(fsw)

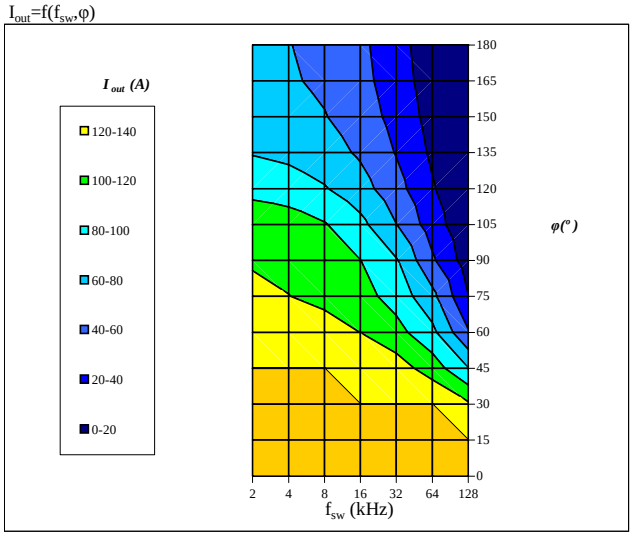


Conditions:	T_j=	150/125	°C	φ=	90°
	DC link=	700	V		
parameter:	Heatsink temp.				
	Th from	50	°C to	100	°C
	in	10	°C	steps	

Figure 22. for neutral point IGBT + half bridge FWD

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

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

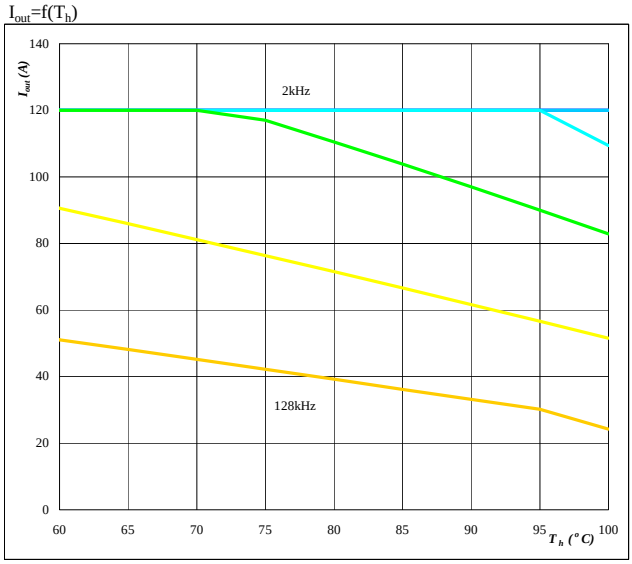


Conditions:	T_j=	150/125	°C
	DC link=	700	V
	T_h=	80	°C

Figure 23. per PHASE

Typical available output current as a function of heat sink temperature

$I_{out}=f(T_h)$

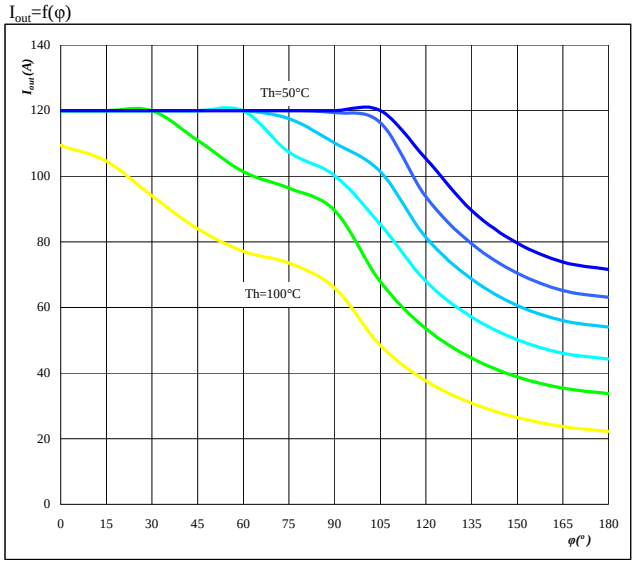


Conditions: T_j= 150/125 °C
DC link= 700 V
φ= 0 °
parameter: Switching freq.
fsw from 2 kHz to 128 kHz
in steps of factor 2

Figure 24. per PHASE

Typical available output current as a function of phase displacement

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

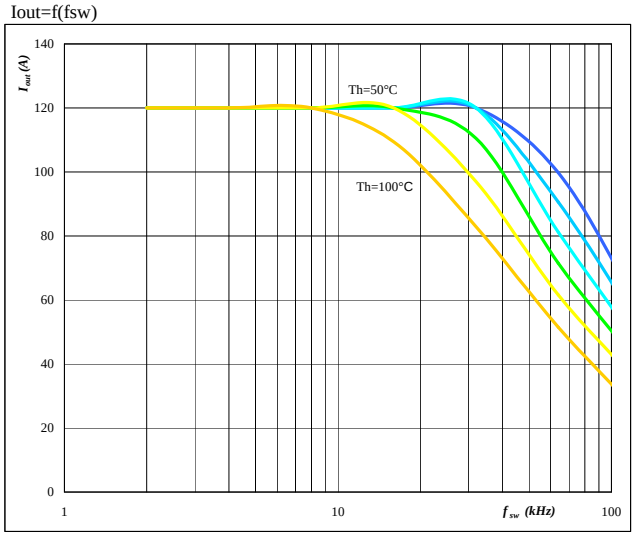


Conditions: T_j= 150/125 °C
DC link= 700 V
f_{sw}= 16 kHz
parameter: Heatsink temp.
Th from 50 °C to 100
in 10 °C steps

Figure 25. per PHASE

Typical available output current as a function of switching frequency

Iout=f(fsw)

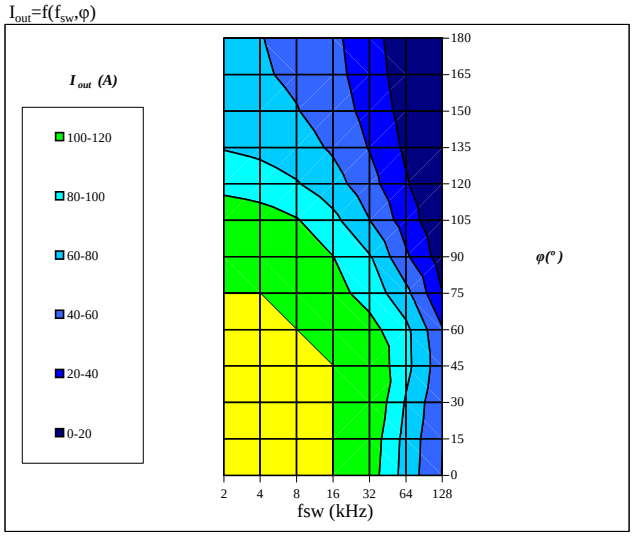


Conditions: T_j= 150/125 °C φ= 0 °
DC link= 700 V
parameter: Heatsink temp.
Th from 50 °C to 100
in 10 °C steps

Figure 26. per PHASE

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

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

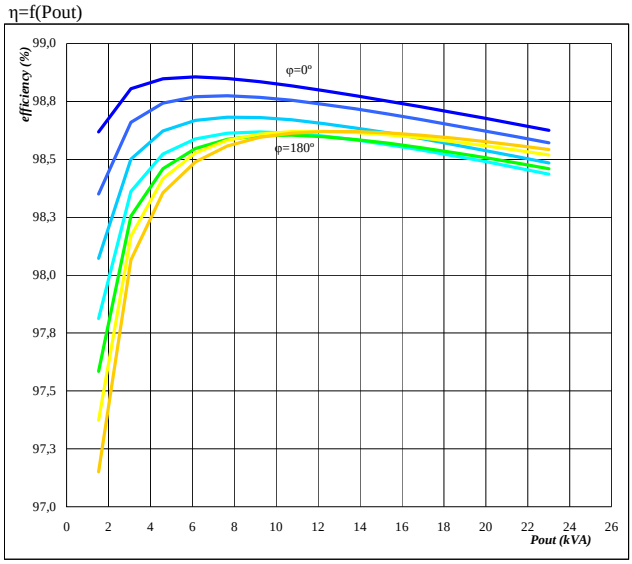


Conditions: T_j= 150/125 °C
DC link= 700 V
T_h= 80 °C

Figure 27. per PHASE

Typical efficiency as a function of output power

η=f(Pout)

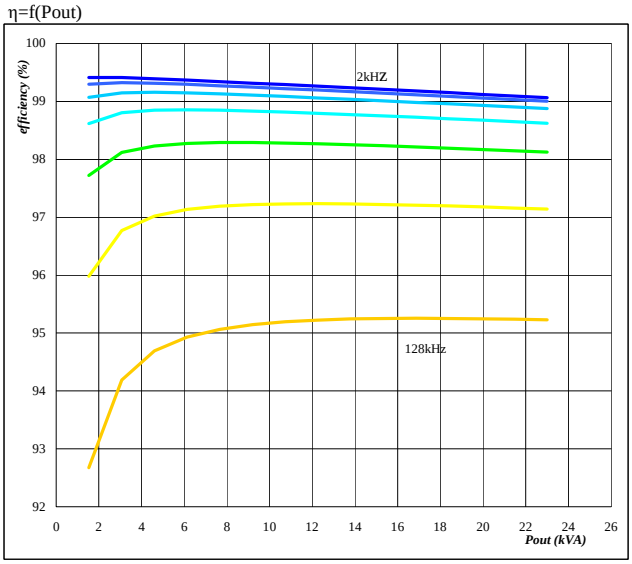


Conditions: T_j= 150/125 °C
f_{sw}= 16 kHz
DC link= 700 V
parameter: phase displacement
φ from 0 ° to 180 °
in steps of 30 °

Figure 28. per PHASE

Typical efficiency as a function of output power

η=f(Pout)

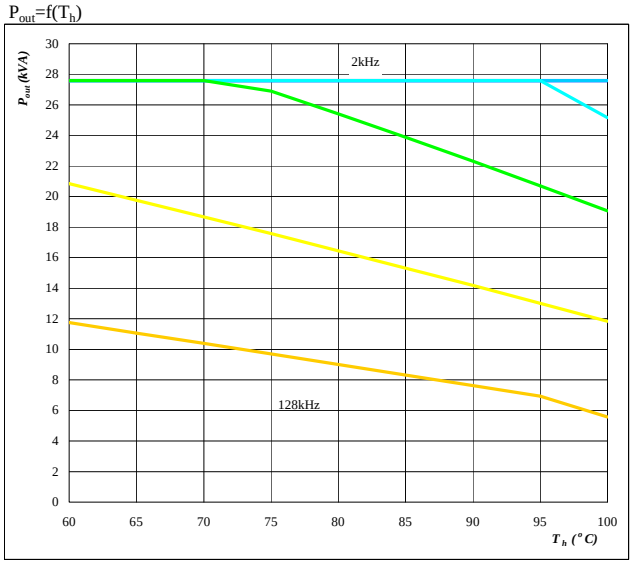


Conditions: T_j= 150/125 °C φ= 0 °
DC link= 700 V
parameter: Switching freq.
fsw from 2 kHz to 128 kHz
in steps of factor 2

Figure 29. per PHASE

Typical available output power as a function of heat sink temperature

$P_{out}=f(T_h)$

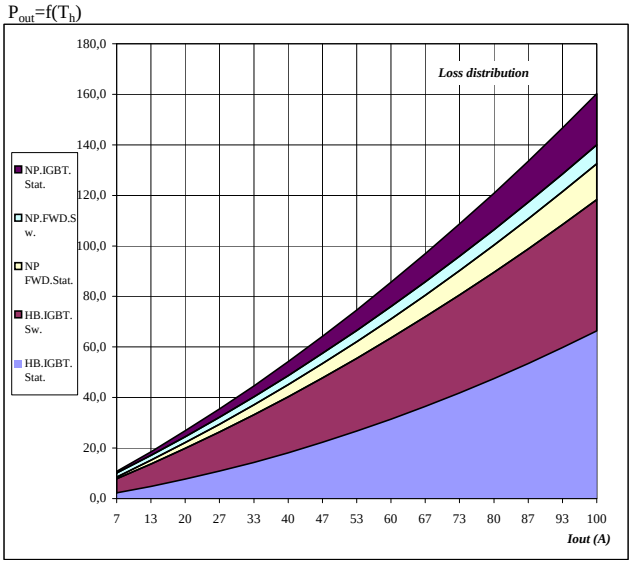


Conditions: T_j= 150/125 °C
DC link= 700 V
φ= 0 °
parameter: Switching freq.
fsw from 2 kHz to 128 kHz
in steps of factor 2

Figure 30. per PHASE

Typical loss distribution as a function of output current

$P_{out}=f(T_h)$

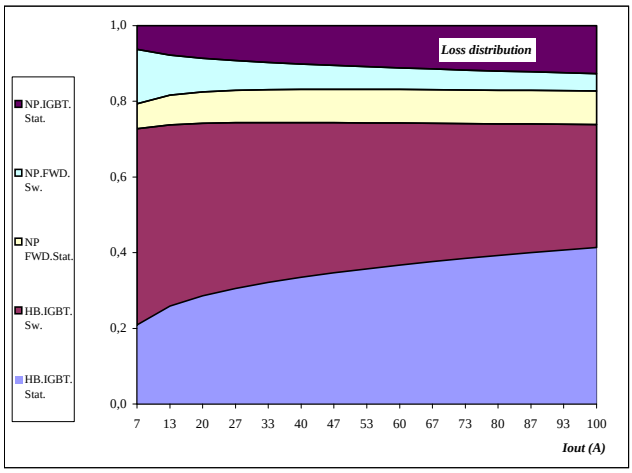


Conditions: T_j= 150/125 °C
f_{sw}= 16 kHz
DC link= 700 V
φ= 0 °

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